

A Clean, Clear and Uncluttered Windscreen – Your View to Safer Driving!



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A clean and good-looking vehicle is a top priority of many motorists. Keeping the car clean is as important as ensuring the safety of the passengers inside the car and also other road users. One must always be aware of the different changes in a vehicle such as smell, look, noise etc. A windscreen is one such major aspect of a vehicle, for example, a crack, chipped or soiled windscreen will not only look bad but also challenge safety concerns. To ensure a vehicle is good to drive and offers a clear view of the road, it's important to keep the windscreen clean, clear and free from any obstructions that might impede vision. This article looks at the development of windscreens since their inception and the dangers of the early glass pane which lead to many incidents referred to as the "Glass Necklace" in collisions. Benedictus' serendipitous discovery of laminated glass and its development to the present day is detailed. This paper also looks forward to the futuristic and innovative "Gorilla Glass" for its durability, lightness and clarity and the advent of wiperless windscreens by McLaren who has been using ultra-sonic sound to repel rain. Finally, a conclusion is given.

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“In most cases optical information for the driver of a vehicle passes through the windshield or side and rear windows of the driver’s cabin. The optical transformation properties of the windshield and windows therefore play an important role in the conservation of correct information. Moreover, the windshield should not be the source of additional irregular information which leads to a misunderstanding of the surroundings and, as a result, to dangerous reactions of the driver”. Kessler 1991.1

Introduction

On October 2017, National Health Service (NHS) doctor, Suzanna Ball was killed whilst cycling in Birmingham. Despite it being illegal to operate a large goods vehicle (LGV) with an obscured windscreen, this fatal accident happened because the lorry driver failed to see her even though she was wearing hi-visibility clothing. Even though the majority of drivers and operators take road safety extremely seriously however; we still regularly see many vehicles of all categories with dirty and cluttered windscreens. In this instance, the driver’s vision was obscured by a tray and its contents, which blocked a large area of the windscreen. The driver was sentenced to two years and 21 months in prison and banned from driving for two years and 10 months. His company was fined £112,500 and ordered to pay £3,000 costs.² Also, in 2018, Hayley Sterna (51) failed to see her cousin - wheelchair-bound Chris Clements (40) - at the roadside in Cambridgeshire as she was dazzled by sunlight reflecting off the dirt on her windscreen. This was despite Clements wearing a high-vis jacket and having high-visibility markers on his wheelchair. Sterna’s windscreen washer bottle had run out of water as she had failed to fill it up before leaving home. She received a 12-month suspended sentence and was banned from driving for two years.³

¹ Kessler, F. (1991). *Light diffusion characteristics and visibility interferences in automobile windscreens*. Paper presented at the vision in vehicles – IV, University of Leiden, the Netherlands, 27-29 August 1991. Academia.edu

² DVSA-*The importance of keeping windscreens clear – a tragic reminder*. Institute of Transport Administration. iota.org.uk

³ The Irish Sun. 30 September 2019. *Clear as Mud. How driving with a dirty windscreen could see you slapped with a €5000 fine and nine penalty points*.

Drivers on the road today do not even remember a time when cars were manufactured without windscreens/windshields, so the history of one of the most important vehicle safety features is nearly forgotten. However, this paper provides an opportunity to look both forward and glance into the past, and so tells the story of the windscreen's development. The front window of a car or the one the driver looks through while driving is called the windscreen or windshield (US) depending on your geographical location and part of its purpose is to protect you and the car's occupants from wind, rain, various types of insects and road debris etc. The idea of having a see-through protective layer installed on the vehicle itself did not appear until 1904, over a decade after the first car rolled off the assembly line. The first windshields were nothing more than two sheets of window-pane glass. Many models had an upper pane which could be folded down when it got too dirty to see through. While these first windshields offered some protection against wind and road debris, they were not standard equipment until Oldsmobile (US) made them so in 1915. However, early windshields were very dangerous to passengers and passers-by in the event of an accident because they shattered into sharp shards. The first cars were essentially motorized horse carriages, and like horse-drawn buckboards,⁴ did not offer any frontal protection from the elements or road debris etc. In fact, drivers wore goggles and other suitable clothing for protection.

Benedictus' Serendipitous Discovery⁵

During the 1910s-1920s, improving the safety of glass used in automobiles became an interest among all automakers, and they got some help from unlikely sources. Two European inventors developed glass laminating - Frenchman Edouard Benedictus and Briton John C. Wood. Benedictus, an accomplished artist, writer, composer, book binder, fabric designer, and scientist, made an accidental discovery in his laboratory. One day in 1903 while working in his Paris laboratory, chemist Benedictus (born in France 1878) climbed a rickety ladder to fetch some needed elements off a high cabinet. In the process, he bumped a shelf lined with tipsy glass flasks, sending one tumbling to the floor. Predictably, the flask shattered. But much to Benedictus' astonishment as he peered down from his perch, the pieces didn't scatter across the floor. Instead, they clung together, roughly retaining the original hollowed shape of the container.

⁴ A Buckboard is a 4-wheel wagon of simple construction meant to be drawn by a horse or other large animal. The Buckboard is the front-most board on the wagon that acts as both a footrest for the driver and protection for the driver from the horse's rear hooves in case of a 'buck'. The Buckboard is steered by its front wheels which are connected by a single axle.

⁵ Transcript – Edouard Benedictus (1878) *Accidental safety glass*. Apple podcasts preview. [podcastapple.com](https://podcast.apple.com)

Intrigued, Benedictus showed the broken flask to his assistant. The man informed his boss that the container recently held a solution of cellulose nitrate, a kind of clear liquid plastic. The pair deduced the water in the solution had evaporated, leaving a thin transparent film covering the inner walls of the flask. Because the container looked empty and unused, it had simply been replaced on the shelf without being washed. Serendipitously and entirely by accident, Benedictus had discovered safety glass. In another of the many serendipitous coincidences with which history is filled, that same week a Paris newspaper ran an article about a new concern arising around the city—collisions involving motor carriages. Automobiles were new to Paris in 1903, and the intersection of overly enthusiastic drivers and unwary pedestrians was already proving disastrous. Upon reading the account of accidents involving automobiles, Benedictus was struck by one detail in particular — many of the most serious injuries involved drivers being horribly cut by the shattered plate glass of their windscreen. Benedictus had his Eureka moment. As he would record in his diary: *“Suddenly there appeared before my eyes an image of the broken flask. I leapt up, dashed to my laboratory, and concentrated on the practical possibilities of my idea.”* Benedictus spent the next twenty-four consecutive hours at work in his lab, feverishly coating one glass flask after another with various mixtures of clear plastic then smashing them around the room. Had any of Benedictus’ assistants walked in on their boss at the time, they would have likely concluded the man had gone daft from inhaling noxious chemical fumes. By the following evening, Benedictus continued in his entry, *“I had produced my first piece of Triplex (safety glass) — full of promise for the future.”* Benedictus spent years improving his creation, adding a layer of gelatin to the film to bind two panes of glass together for greater strength. He finally received a patent for his invention in 1910. Unfortunately, early automakers didn’t share Benedictus’ enthusiasm for his new idea despite the fact they had already begun producing models with fully enclosed passenger compartments.⁶ This meant they were surrounding occupants with glass windows that, in an accident, instantly transformed into a whirlwind of razor-sharp shards.⁷ Though Benedictus was granted a patent in 1909, the product was not put into use until World War I when laminated glass was used in the goggles of gas masks. Meanwhile Wood had also been working with cellulose and devised another method for adding a protective layer (originally tree resin, later cellulose) between two pieces of glass and creating shatter-resistant glass. His method was patented in 1905. Benedictus, in 1910, added a gelatin layer which stuck to both panes of glass and patented Triplex.

⁶ *Accidental Inventions – Safety Glass*. blog.42courses.com

⁷ *Accidental Inventions – Safety Glass*. blog.42courses.com

The Triplex Glass Company was founded in 1923 and Triplex glass was brought to the U.S. in the twenties. Others took up the task of improving on Benedictus' laminated glass, including Carleton Ellis who patented a resin laminate that bonded glass without discoloration. By the 1930s, laminated auto glass was made using polyvinylbutyral (PVB), which made it stronger and afforded protection from UV rays and noise.

The 1930s -1950s: New Design Possibilities

Improvements in automobile glass and engineering led to a number of innovative windshield designs in the first half of the 20th century. In the 1930s, Cadillacs offered cars with a V-split windshield that allowed half of the windshield to swing out. Chevrolet countered with a tiltable windshield. In the later part of the decade, the single curved windshield was developed, providing superior strength and body integrity. New design innovations in the 1940s were driven by safety concerns. Tucker cars advertised "pop out" windshields that would eject in one piece if impacted by a hard blow from the inside. Panoramic curved windshields of the 1950s boasted improved visibility by shrinking blind spots. By reducing framing, these windshields also allowed for more spacious car interiors. As a result, automobile designs became less boxy.

British Standards Institution Specification BS 857 1954

In Great Britain, the Road Traffic Act of 1930 made it compulsory to use safety glass in all vehicle windscreens. Later regulations specified that safety glass should be used not only for windscreens and windows on either side of the driver's seat but for all windows of cars. For goods vehicles the windscreen and windows by the driver's seat must be of safety glass, as also must forward facing windows of public service vehicles. Safety glass as defined by the British Standards Institution, in its specification B.S.857 1954:⁸

"Is a glass which after fracture gives fragments which are less liable to cause severe cuts than those of ordinary glass".

Two types of glass known as 'Toughened' and 'Laminated' comply with this specification, and at present there is much controversy regarding their relative merits. Toughened glass on fracture breaks into fragments that are small and have rounded edges that are not likely to inflict serious injury, whereas laminated glass when fractured usually has razor sharp edges that can inflict severe lacerations.

⁸ British Standards Institution. *Safety Glass for Land Transport*. British Standard 857: 1954.

It might be thought therefore that toughened glass would be preferable but there are other safety aspects to be considered. Fracture of a toughened glass windscreen may result from impact by a stone flung up by another vehicle or it may sometimes occur spontaneously, but, whenever fractures occur, the whole windscreen breaks up into relatively small fragments and the driver's view is impaired. If a laminated glass windscreen is cracked by a stone the fracture is usually confined to a small area around the point of impact. In weighing up the relative safety merits of the two kinds of glass, account should be taken of the relative likelihood of injury arising from impact and the likelihood of accidents arising from a sudden impairment of the driver's vision which in turn depends on the relative frequency of windscreen fracture. It may also be desirable to consider the cost of glass replacements and if possible, the rather intangible items such as inconvenience and discomfort. In some countries which do not have temperate climates, windscreen fracture may subject the occupants of the vehicle to harm because of severe cold or torrential rain or dust. These matters have already been discussed in previous publications by *Lister (1961)*⁹ and *Starks (1954)*¹⁰ but this report¹¹ describes an attempt that has been made to find out more about the incidence, nature and severity of injuries caused by car windscreen glass in accidents that have been the subject of detailed investigation to many on site by a research team from the Road Transport Research Laboratory. These accidents- over 1,000 of them - occurred during the years 1955-1964 in the vicinity of the Laboratory when it was based near Slough, Buckinghamshire.¹²

The Law & Penalties¹³

Vehicle owners have a responsibility to make sure their driving doesn't negatively impact other motorists. One way this could happen is by having a dirty windscreen or another glass surface, such as the side mirrors or rear windscreen. Having an unclear windscreen could impair your vision, making reaction times slower which could lead to an accident. Regulation 30 of The Road Vehicles (Construction and Use) Regulations 1986, state that drivers are required to keep class surfaces clean and clear. Also, the Highway Code (Annex 6, Vehicle Maintenance) states:

- Lights, indicators, reflectors, and number plates MUST be kept clean and clear

⁹ Lister R. D. (1961). "*Safety Glass for Windscreens*". *Automobile Engineer*. 51, (9), 341-7.

¹⁰ Starks H.J.H. (1954). "*Toughened Glass*". *Automobile Engineer*. 44 (10), 433-8.

¹¹ British Standards Institution. *Safety Glass for Land Transport*. British Standard 857: 1954.

¹² A. Hobbs et al (1968). *Injuries produced by motor-car windscreens*. Road Research Laboratory Ministry of Transport. RRL Report LR 152.

¹³ Mirror. mirror.co.uk

- Windscreens and windows MUST be kept clean and free from obstructions to vision

"All glass or other transparent material fitted to a motor vehicle shall be maintained in such condition that it does not obscure the vision of the driver while the vehicle is being driven on a road," it explains.

If you were to have an accident as a result of having a dirty windscreen, you could be fined and charged for careless driving. Punishments for careless driving range from an on-the-spot fine of £100 and three penalty points. However, if your case was to go to court then you could see that fine increase to £5,000 and receive up to nine penalty points. Serious offences could also see you lose your driving licence.

Irish Legislation

Laminated safety glass must be fitted to all vehicles first registered on or after 1st January 1986. Windscreens are acceptable provided they meet British Standards (BS) Codes of Practice BS AU 242 and BS AU 251. ¹⁴ S.1.No. 190/1963 – Road Traffic (Construction, Equipment and Use of Vehicles, Regulations 1963, Section 24 (1) states:

"Where a windscreen is fitted to a vehicle, it shall be of a suitable substance, fully transparent so that objects are not seen distorted through it and not likely if fractured to produce fragments capable of causing severe cuts". ¹⁵

If the driver's view of the road and other traffic either to the front or side of the vehicle is limited or distorted by an object for example, a sticker, signage etc. that prevent the driver from driving safely, it is illegal and should be removed. ¹⁶ If a tinted sun-strip comes down below the tip of the windscreen wipers, it can impair the driver's vision and prevent him from having a clear view of the road. Also, under the above legislation, the driver must have a view to the front and side of the vehicle at all times necessary to enable him to drive safely. Heavily tinted windows present a significant safety hazard for vehicle drivers and their occupants.

¹⁴ NCT Manual 2018. Passenger vehicles (up to eight passengers). rsa.ie

¹⁵ irishstutebook.ie

¹⁶ FAQs on Vehicle Glass – Glazing and Line of Vision. rsa.ie

Visibility is greatly reduced particularly at night or times of low light and may prevent drivers from seeing other road users or pedestrians.¹⁷ Under EU type approved regulations,¹⁸ all cars registered since 1988 must have a minimum light transparency of 70% in the windscreen and front side windows. Under roadworthiness testing regulations a vehicle with a light transparency of less than 65% will fail the national Car Test (NCT) test. Darkening a vehicle's windscreen more than this or increasing the size of a vehicle's sunblock would be illegal.

The 60s to Today: Safety First

Increased driver safety is largely credited to Ralph Nader's lobbying for government standards in the 1960s.¹⁹ Then, federal standards were established for windshield strength and clarity and limits on windshield penetration. The auto glass industry continues to improve windshields to offer more protection and comfort. Nano-technology²⁰ promises increased UV protection, limited heat absorption, heads-up display potential and self-cleaning windshields. The windscreen (or windshield US) is designed to enhance visibility of the traffic environment and, in more recent times, to contribute to the structural integrity of the vehicle. In some vehicles the windscreen is designed to contribute to the overall structural strength and may be required to play a significant role in the deployment of driver and passenger airbags. Modern windscreens are generally made of laminated safety glass – that holds together when shattered – a type of treated glass which consists of typically two curved sheets of glass, with a plastic layer laminated between them for safety and bonded into the window frame. UV coating may be applied to screen out harmful ultraviolet radiation. However, this is usually unnecessary since most car windscreens are made from laminated safety glass.

High Penetration Resistant Glazing

The standard type of windshield glazing used in today's passenger cars is known as "HPR", or High Penetration Resistant Glazing.

¹⁷ rsa.ie

¹⁸ Industrial Glazing Standards 92/22/EEC of 31 March 1992. European Economic Community 1992. Official Journal of the European Community. 1992' L 129: 11-94.

¹⁹ Ralph Nader is one of America's social critics. He first made headlines as a young lawyer in 1965 with his book "*Unsafe at any Speed*", a scathing indictment that lambasted the automobile industry for producing unsafe cars. His book led to congressional hearings and the passage of a series of safety laws in 1966. nadar.org

²⁰ Nano-technology is a field of research and innovation concerned with building "things" – generally materials and devices on the scale of atoms and molecules.

The safety effect of conventional (HPR) windshield glazing, which has been standard equipment in passenger cars since 1966, was studied in an earlier (1985) report published by the National Highway Traffic Safety Administration (NHTSA). That report, entitled *"An Evaluation of Windshield Glazing and Installation Methods for Passenger Cars,"* found that HPR glazing greatly reduced the risk of serious lacerations to the face, scalp, and mouth, as well as fractures of the facial bones and nose, and ocular avulsions.²¹ It was estimated that the introduction of the HPR windshield reduced these types of injuries by 50 to 75 percent, as compared to the number of injuries that would have been expected to occur with pre-HPR windshield glazing. These rather dramatic findings were attributed to an improved method of bonding together the two glass outer plies and the single plastic (polyvinylbutyral) interply which comprise the windshield. This production achievement substantially increased the impact velocity required for an occupant's head to tear through and penetrate the plastic interlayer, given a crash event. Serious windshield injuries are typically associated with windshield penetration. In addition to the serious injury reduction, the HPR windshield design was also credited with a 25 percent reduction in minor severity windshield-induced^{22 23} lacerations. This secondary benefit was attributed to another characteristic of the HPR design which caused the glass to crack into smaller, less injurious pieces, than in pre-HPR glazing. Minor windshield lacerations are typically associated with impacts sufficient to break the inner glass ply, but not sufficient to cause windshield penetration.²⁴ In 1980, the Saint Gobain Vitrage Company (France) petitioned the NHTSA to amend Federal Motor Vehicle Safety Standard (FMVSS 205) to permit the use of a new glazing product developed by the company. The product, trade named "Securiflex," was a new type of glazing generically referred to as "glass-plastic" glazing. Glass-plastic glazing differs from conventional, 3-ply windshield glazing in that the inside glass surface - i.e., the side which faces the vehicle passenger compartment - is covered with a thin plastic sheet of polyurethane.

²¹ Kahane, C.J. *An Evaluation of Windshield Glazing & Installation Methods for Passenger Cars*. DOT HS 806 693, February 1985. crashstats.nhtsa.dot.gov

²² Federal Motor Vehicle Safety Standard (FMVSS) No. 205. Glazing Materials.49 Code of Federal Regulations. Parts 400 to 999. Revised as of October 1991.

²³ Kahane, C.J. *An Evaluation of Windshield Glazing & Installation Methods for Passenger Cars*. DOT HS 806 693, February 1985. crashstats.nhtsa.dot.gov

²⁴ Kahane, C.J. *An Evaluation of Windshield Glazing & Installation Methods for Passenger Cars*. DOT HS 806 693, February 1985. crashstats.nhtsa.dot.gov

Blunt Impact Trauma

The primary safety benefit anticipated from the addition of the plastic film is a reduction in lacerative injuries to occupants who contact the windshield during crashes. The plastic inner layer is expected to contain broken glass shards and keep them from coming into contact with the occupants' skin. Following further study of glass-plastic glazing, including a review of public comments solicited on the subject, the agency, in 1983, amended FMVSS 205 to permit the use of glass-plastic glazing at the option of the motor vehicle manufacturer. ^{25 26}

The objectives of this study were:

- (1) To estimate the extent to which glass-plastic windshield glazing could reduce lacerative injuries resulting from occupant contact with the windshield in motor vehicle crashes,
- (2) To assess the nature, extent, and consequence of durability problems associated with the widespread use of glass-plastic windshields in motor vehicles,
- (3) To estimate the costs of using glass-plastic windshield glazing in motor vehicles, as compared with the costs of conventional windshield glazing.

When the agency authorized the use of glass-plastic glazing in 1983, it believed that the new material, if used in the windshields of all passenger cars, had the potential to essentially eliminate all lacerative type injuries resulting from occupant-windshield contact occurring in motor vehicle crashes. According to the agency's earlier evaluation study of conventional High Penetration Resistant Glazing (HPR) windshield glazing, an estimated 450,000 lacerations per year — the large majority of which were minor in nature - still occurred after the HPR windshield was incorporated into ^{27 28} the vehicle fleet. Most of the more serious lacerations were found to have been eliminated by the HPR windshield.

²⁵ Federal Motor Vehicle Safety Standard (FMVSS) No. 205. Glazing Materials.49 Code of Federal Regulations. Parts 400 to 999. Revised as of October 1991.

²⁶ Final Regulatory Evaluation, Anti-Lacerative Glazing, FMVSS 205. Office of Program & Rulemaking Analysis. NHTSA, September 1983.

²⁷ FMVSS 205. Glazing Materials. 49 Code of Federal Regulations. Parts 400 to 999. Revised as of October 1991.

²⁸ Parsons, G. (November 1990). *Motor Vehicle Fire in Traffic Crashes & the Effects of the Fuel System Integrity Standard*. DOT HS 807 675.

While the agency projected a dramatic reduction in lacerations, it also recognized that the softer nature of the plastic inner liner could result in durability problems from scratching or other types of abrasion that could result from the day-to-day motor vehicle operational environment. Such damage, if significant, could adversely affect driver visibility as well as customer satisfaction with the product. There was also some concern that the stiffer inner surface presented by the 4-ply glass-plastic windshield might contribute to an increase in head injuries generally associated with blunt impact trauma (i.e., concussions, contusions, complaint of pain). While it was recognized that these problems could arise, the potential safety benefit from glass-plastic glazing was believed to far outweigh any durability or other problems that might be associated with the material. Also, by permitting, but not requiring, glass-plastic glazing to be installed in vehicles, the agency provided a basis whereby actual, in-use data could be developed to permit an evaluation of the safety and durability issues.²⁹

Broken Glass & Windscreen Impact

Victims who are injured by flying broken glass may be restrained by seatbelts or protected by airbags and still sustain deep lacerations, shock, severed limbs, or fatality. Lacerations can be dangerous, particularly if they penetrate all the way to bone. If a car accident victim bleeds too much from broken glass lacerations that cut vital arteries, it is possible that he or she will die or require an amputation.³⁰ Broken glass coming at the face and upper body at high speeds can pose a huge risk to drivers and passengers. Often glass-related injuries are due to the force of the car crash. When two vehicles hit each other, the glass may shatter. There are some car designs that utilize glass that has a lower likelihood of shattering, but at high speeds, this design may not matter. In a T-bone accident, side windows may break and send glass flying in all directions. Similarly, in a forceful rear-end collision, rear-window glass may go flying and injure the heads of passengers. Lacerations can be dangerous, particularly if they penetrate all the way to bone. Sometimes it becomes necessary to amputate a lacerated, infected body part and in other cases, lacerations result in permanent disfigurement and scarring. Surface-level skin cuts may be less serious, but they may also require medical treatment. When lacerations are experienced, it is common for accident victims to also experience shock.

²⁹ *An Evaluation of the Effects of Glass-Plastic Windshield Glazing in Passenger Cars*. National Highway Traffic Safety Administration (NHTSA) 9 November 1993. NHTSA Report DOT HS 808 062

³⁰ Katz Friedman (KF) Chicago Lawyers. *Broken Glass & Windshield Impact*. kfeej.com

This can result in psychological trauma and the possibility of death. If a car accident victim bleeds too much from broken glass lacerations that cut vital arteries, it is possible that he or she will die or require an amputation.³¹

Insurance Claim May be Impeded

As cars get lighter and pillars get thinner, greater reliance has been placed on windscreens to provide occupant protection in rollover accidents. Research has shown that in these situations, the displacement of the roof towards the occupants of the car can be increased by up to 30%, if a windscreen is damaged or poorly bonded. It goes without saying that you and your passengers should wear your seat belts at all times. However, in the event of a collision, your windshield also serves as a barrier to protect you and your passengers from being ejected from the car. If your windscreen has even a minor crack, this means it is fundamentally weaker than it needs to be and may not be able to withstand the force of a body being hurled against it. Your windscreen also plays a pivotal role in the handling characteristics of your car, as modern windscreens provide up to 34% of the torsional stiffness. In a similar vein, your windscreen serves as a means to dissipate impact and spread the force of a collision throughout your chassis. If the windscreen is damaged, this benefit is lost. Chips are repaired using our revolutionary resin repair system. In some cases a blemish will be visible in place of the chip, but following a chip repair the structural integrity of the windscreen will be fully restored, making your vehicle safe to drive again. As a rule of thumb, you should always tend to chips large or small as soon as they appear. Road vibrations and changes in temperature will turn these chips into cracks, making what could have been a repair into a more expensive replacement. It's important for drivers to be aware of the safety issues associated with a damaged windscreen. Even minor windscreen damage shouldn't be taken lightly and should be dealt with as soon as it appears. A little issue can quickly snowball, especially at this time of year when your windscreen is exposed to more extreme conditions. Another consideration is the potential effect a damaged windscreen can have on your insurance coverage. If your insurer can establish that you failed to rectify a damaged windscreen in advance of an accident, it may impede your claim.³²

³¹ Katz Friedman (KF) Chicago Lawyers. *Broken Glass & Windshield Impact*. kfeej.com

³² Auto Glass. *The Danger of Driving With a damaged Windscreen*. autoglass.ie

After An Accident - Establishing Negligence

If you were harmed by broken glass or due to hitting the windshield in a car accident, you may be able to recover damages by establishing another driver's negligence, and a knowledgeable injury lawyer can assist you in this process. You'll need to show: (1) the defendant owed you a duty; (2) the defendant breached this duty, (3) causation, and (4) actual damages. The other driver may raise the issue of comparative/contributory negligence, and in that case, the other driver would need to show your negligence. The jury would evaluate the evidence and arguments, determine damages, and reduce your damages by an amount proportionate to the degree of fault you were assigned. Many accident victims also have to address other medical issues even after they heal. Broken glass can cause disfiguring scars that may be painful for the rest of the victim's life. There is an increased risk of infection wherever glass penetrates the body and these infections, not properly treated, may be fatal. Visible scars can also alter quality of life and a victim's ability to attract a partner or get a job. Damages that may be recovered after suffering injuries from broken glass during a car accident may include coverage for medical bills, rehabilitation, therapy, replacement services, scarring, disfigurement, loss of enjoyment, pain and suffering, mental anguish, and loss of consortium. The value of scarring can vary greatly. Generally both insurance adjustors and jurors find that scarring has a greater value if it is in a visible place e.g. the face. Bias can also influence the award for scarring or disfigurement. The jury may be inclined to believe that scarring or disfigurement on the face more substantially impacted the emotions of a plaintiff who was a young female model than it would have an elderly old man.

Case Law

Express warranties are specific representations made by the manufacturer or seller about the quality of the product or its fitness for an intended purpose. An example of an express warranty was found in the case of *Baxter v Ford Motor Company et al (1932)*.³³ Here, the plaintiff purchased a Model A Ford town sedan from defendant St. John Motors, a Ford dealer, who had acquired the automobile in question by purchase from defendant Ford Motor Company. The plaintiff claims that representations were made to him by both defendants that the windshield of the automobile was made of non-shatterable glass which would not break, fly or shatter. The windshield of the plaintiff's car was shattered by a pebble, resulting in the plaintiff losing an eye.

³³ *Baxter v Ford Motor Company et al (1932)* 168 Wash. 456, 12 P.2d 409 (1932)

He sued Ford's and the dealer who sold him the car on the grounds that the company (Ford's) had advertised the windscreen on their cars was shatterproof. The Washington State Court held that Ford's marketing statements were an express warranty and thus the company was liable for failure of its product to perform as expected. However, the opposite occurred in the following case of *Fardom v Harcourt Rivington (1932)*.³⁴ An inevitable accident is one which is physically unavoidable. In other words it is one which could not possibly be prevented by the exercise of reasonable care, caution and skill. Here, the defendant parked his car and left his dog inside with doors and windows shut. As the plaintiff passed the side of the car, the dog which had been barking and jumping around smashed a glass panel and a splinter entered one of the plaintiff's eyes which had to be removed. The plaintiff sued the defendant for damages.

In his summing up, Lord Dunedin, holding the defendant not liable stated that:

“There is such an extremely unlikely event that I do not think any reasonable person could be convicted of negligence, if he did not take into account the possibility of such an occurrence, and provide against it either by not leaving the dog in the car or by tying it up, so that it could not reach the window. People must guard against reasonable probabilities, but they are not bound by fantastic possibilities”.³⁵

(The rationale behind Lord Dunedin's findings is that people must guard against reasonable possibilities, but they are not bound to guard against fantastic possibilities and because of inevitable accidents, there is no liability. Therefore the defendant could not be held liable for this bizarre occurrence. Ed.)

Toughened v Laminated - Which is Better/Safer?

Toughened glass, also known as tempered glass, is manufactured using a controlled thermal process. Essentially, this involves heating the glass in a tempering furnace – until it reaches approximately 650°C – and subsequently removing the glass and allowing it to quickly cool. The process is designed to improve the overall structural durability of the glass, increasing its resistance to heat and shock (by 400-500%) and significantly reducing the likelihood of it breaking.

³⁴ 146 LT 391

³⁵ (1932) 146 LT 396. S. P. Singh. *Law of Tort: Including Compensation under the Consumer Protection Act*. books.google.ie

Toughened safety glass is around five times stronger than standard glass and, if subjected to high-pressure impact, it will break into small blunt pieces rather than dangerous pointed shards. Tough and multi-purposeful, clear toughened glass is ideal for a wide range of domestic and commercial applications. For example, it is commonly used to create kitchen worktops and splash-backs, shower screens, glass shelves, internal partition walls and balustrades. Laminated glass is, essentially, a glass sandwich – made from two panes of glass, with a polyvinylbutyrate (PVB) plastic interlayer—and it is this unique construction that gives it its tough and reliable qualities. Technically speaking, laminated glass is the same strength as regular glass. However, upon impact, the two panes simply shatter and are held in place by the plastic interlayer. The transparency of the glass is not affected in any way and the triple-layer design improves its ability to withstand stress – thus making it a safe option for glass windows, doors, screens, partitions, walkways and more. Due to the different ways in which they are constructed, toughened safety glass and laminated glass each have their own set of pros and cons. But that doesn't mean that one is necessarily better than the other. They are both capable of withstanding high-pressure and heat and, in many cases, they can both be used for the same application. It just depends on your personal preference and the cost. Over the last few years, a third type of safety glass, called toughened laminated glass, has become increasingly popular with designers and architects alike. This product offers the best of both worlds, combining the strength of tempered glass with the unique construction of laminated. It is difficult to break, it comes in various thicknesses, and it is perfect for domestic, commercial and automotive use.

Glass-Plastic Windscreen-Additional Protection

Glass-plastic glazing was first developed in France by the Saint Gobain Vitrage Company, and some of the European car companies (among them, Peugeot, Porsche, and Mercedes) had fitted a limited number of their vehicles with glass-plastic windshields in the late 1970's and early 1980's to test the material in the market place. In the early 1980's, two domestic companies, General Motors and Ford, equipped a number of their vehicles with glass-plastic windshields and placed them in rental fleets to field test the windshields. Later, in 1984, General Motors introduced the glass-plastic windshield to the general public, by making it standard equipment on one of its luxury car models, the Cadillac Seville Elegante. Early in the 1985 model year, the windshield was made standard on all Seville models, and for model years 1986 and 1987, the company expanded its use of the plastic windshield glazing, making it standard on all Cadillac Eldorados, all Buick Rivas, all Oldsmobile Toronados, and all I X Pontiac 6000 STE's.

At the end of the 1987 model year, however, General Motors discontinued all use of glass-plastic windshields in its regular production vehicles. GM stated that the reason for discontinuing installation of the windshield was because of its high replacement costs for customers and high warranty costs for the company. It is estimated that approximately 210,000 regular production GM cars with glass-plastic windshields were produced before the company halted use of the windshield. No other car companies, domestic or import, have since equipped any of their U. S. marketed regular production vehicles with glass-plastic glazing.³⁶ The essential promising aspect of the glass-plastic windshield was its considered potential to further reduce windshield-induced lacerations. While the HPR windshield had substantially reduced these types of injuries, a considerable number still remained, primarily those in the minor severity category. The conventional windshield is a three-ply design consisting of two plies of glass sandwiched around a thin interply of plastic (polyvinylbutyral). The glass plastic windshield is of similar design with the exception of an inner plastic liner (polyurethane) that is bonded to the inside glass ply-i.e., the side of the windshield which faces the passenger compartment. The inner plastic liner would be expected to provide additional protection (over that afforded by the HPR design) against cuts from broken glass shards produced when occupants collide with the windshield during crashes. The plastic liner would provide a "containment mechanism" for the broken pieces of glass, thereby reducing the occupant's chances of coming into direct contact with the sharp edges of these glass fragments. While glass-plastic windshields were expected to substantially reduce lacerative injuries, there was concern that the inner plastic layer, being a much softer material than glass, could be susceptible to damage that could degrade driver visibility and reduce windshield durability. There was also some concern that the stiffer surface presented by the 4-ply glass-plastic windshield might contribute to a greater incidence of blunt impact injuries (i.e., concussions, contusions, complaint of pain). Overall, however, the potential safety gain from glass-plastic glazing was believed to far outweigh possible durability and other problems, and, therefore, the agency elected to permit (but not require) its use in order that real-world data might be developed to provide an evaluation of these issues.

Windscreen-Strength & Stability

Clean the windows of your vehicle inside and out.

³⁶ *An Evaluation of the Effects of Glass-Plastic Windshield Glazing in Passenger Cars*. National Highway Traffic Safety Administration (NHTSA) 9 November 1993. NHTSA Report DOT HS 808 062

This way you have the best visibility possible when driving. Also make sure to remove any leaves or twigs that may be left in the inlets at the base of the windshield as this can restrict airflow for defrosting the inside of your windows. By removing any debris at the base of the windshield, the de-frosting system can work efficiently. Also make sure the glass does not have cracks or divots on it. Over time, exposure to road debris and grime can cause thousands of tiny pits and scratches in the windshield glass. During the winter months, the pits can cause reflections that may dramatically reduce visibility. Your vehicle's windscreen is one of its most important features, designed to keep you sheltered from the elements, help you maintain a clear view of the road and protect you in an accident. The windscreen forms an integral part of the shell of your vehicle, helping to maintain strength and stability, so it is essential that you keep it properly maintained – and this includes keeping it clean, free from clutter and always choosing a reputable company for repairs or replacements. Keeping your windscreen clean, both inside and out, will reduce glare and ensure you can see the road and any potential hazards clearly. Even if you think your windscreen is clear of dirt and dust, if you haven't had it properly cleaned recently, chances are a grimy haze will have built up that may only be apparent when the sun is bright or low in the sky. If you have a look around your windscreen, can you see a clear difference between the areas your windscreen wipers cover and the surrounding edge? If you can, then there is an obvious build-up of dirt from the road and the elements. If you wipe your hand across the inside of your screen, does it come away dirty? If yes, then you need to give it a good clean to restore a clear view. Be sure to use a specialist windscreen cleaning fluid though, as normal cleaning fluid can leave streaks and smudges which will affect your view.

Windscreen Damage & Visibility Degradation

Windscreen damage can take a number of forms:

- ✓ Overt damage from impacts (e.g.: cracks, “spider web” and “bulls eyes”).
- ✓ Gradual degradation (e.g.: small chips and scratches that can result in “haze”).
- ✓ Cracks and “bulls eyes” can occur in windscreens following an impact. This type of damage usually occurs as the result of a discrete incident or incidents and would be immediately visible to the naked eye.³⁷

³⁷ Nicola Pronk *et al* (2001). *Windscreens and Safety: A Review*. Report No. 183. Monash University Accident Research Centre. academia.edu

Sudden changes in temperature are a lesser-known cause of windscreen damage. This can occur when there is a sudden rapid change in temperature which can cause the glass to contract or expand. Human error often has a part to play in this.

For example:

- Using boiling water to defrost your windscreen;
- Leaving your car sitting in direct sunlight on a very hot day and
- Suddenly blasting the air-conditioning of the car has become very hot inside.

³⁸

Further to this, windscreens degrade over time. Damage to windscreens typically falls into two categories; sudden impact damage and degradation or wear. Sudden impact damage includes cracks, spider webs and “bulls eyes”. Only a couple of studies were identified that considered this type of damage. One study suggested that this type of damage may be distracting to drivers (though this was not supported by research) and the other concluded that this type of damage seemed to cause less of a visual problem than the multiple fine scratches and chips resulting from gradual wear. Windscreens wear and degrade over time. Through use, they are continuously bombarded by small particles such as tiny rocks, sand and dirt that wear the surface. Further to this, windscreen wipers can damage the windscreen over time by scratching tiny particles across the surface. Another factor that may compound the effects of windscreen degradation is soiling. It was suggested that grease and grime - thrown up by spray from a mixture of water, grease, oil, tar and dust - may result in the production of scattered light and further, that the removal of the grease and grime may result in the windscreen being scratched and damaged. De-lamination and “miliness” can also impact negatively upon the quality of windscreens. Delamination occurs when one or both layers of the glass separate from the polyvinylbutyrate interlayer. This can cause different optical effects. “Miliness” occurs when the polyvinylbutyral (PVB) layer separates from the layers of glass and starts to return to its original prelaminated state. When this happens, the windscreen can start to become opaque and return to its prelaminated state making it difficult for the driver to see through the screen. Almost all cars have a dashboard made from polymeric plastics material. When the vehicle is left out in the sun the plasticiser is liberated from the dashboard and forms a thin film on the inside of the windscreen. If the inside of the windscreen is not cleaned regularly, this film can build up and cause dispersion of light through the window. This can affect the drivers vision through distortion if the light from the sun or from the headlights of oncoming vehicles.

³⁸ Autoglass. Autoglass.ie

Migration of the plasticizer can occur following exposure to sun. Under this condition the plasticizer can be liberated from the dashboard and form a thin film on the inside surface of the windscreen. As already mentioned, many vehicles have dashboards that are made from plastic that, in certain light, reflects an image from the dashboard onto the windscreen. This reflection may cause distraction to the driver.³⁹

The Importance of Good Wiper Blades

It is important to have an unobstructed and clear view out of the front windscreen as you drive. (Also, out of all other windows) Part of proper maintenance for your vehicle includes inspecting the windscreen and windscreen wipers. The windscreen should always be kept clean, especially as the weather turns cold. Parking under trees increases the chance for sap, leaves, or bird droppings to collect on your windshield. These obstructions can make it difficult to see properly out of the windscreen. As the weather turns cold, frost and ice left on the windshield can make visibility difficult whilst driving. It is always important to take the time to scrape away any debris or obstruction from all windows of your vehicle so you can see clearly out of them.⁴⁰ A good set of wiper blades is important to clear the windscreen properly. Most wiper blades will last for about two years, depending on the driving conditions, but its good practice to have them changed every year or more often if you use them more than normal, i.e. driving in busy cities or off-road where the build-up of dirt and grime will be more apparent. To help keep the windshield clear and streak-free, the rubber blades need to be free of cracks or cuts. The rubber on the blades also should flex to follow the curved contour of the glass. If the wipers are exposed to the sun long term, it may cause the wiper blades to harden and crack. Prolonged use of the windshield wipers may cause them to wear out prematurely. If you are unsure about the condition of your windshield wipers, pop into your local garage or a Halfords outlet, for an appraisal. New wiper blades can be fitted if necessary and you can be sure your wipers – front and back - are in good condition and will continue to keep your windscreen(s) with a clear view. And remember, to avoid using your wipers on a dry surface, as minute pieces of grit will cause them to deteriorate more quickly, cause possible damage to your windscreen.⁴¹ It's also important to keep the windshield washer fluid reservoir full at all times and especially during the winter months.

³⁹ Nicola Pronk *et al* (2001). *Windscreens and Safety: A Review*. Report No. 183. Monash University Accident Research Centre. academia.edu

⁴⁰ *Keep the windscreen in good condition for your vehicle*. dunriteautomotiveslp.com

⁴¹ The Windscreen Company Group. *Help & Advice: The Importance of Keeping a Clear Windscreen*. thewindscreen.co.uk

Also, make sure to use a de-icing washer fluid to prevent it from freezing when the temperatures get colder. Since the washer fluid is relatively inexpensive, it is a good idea to keep a couple of extra litres on hand. This way you can ensure the best visibility in case you need to refill the reservoir if there isn't a motor accessory store nearby.⁴²

The “Glass Necklace”

Early cars were little more than motorized buckboards⁴³ but it didn't take long for drivers to determine they'd like a little protection from road hazards like sharp flying rocks and the elements. In 1904 when the first windshields were introduced, most were a horizontally-divided piece of plate glass just like the glass used for house windows. When the top half got too dirty to see through, a driver could fold it down and keep going. In 1908, Ford advertised the Model T for \$850 — unless a driver also wanted fancy extras like a windshield, speedometer, and headlights, equipment that boosted the price by another \$100. Likewise, in 1913 Reo⁴⁴ offered a windshield as optional equipment. In 1915, though, Oldsmobile was first to sell the top and windshield as standard equipment. As more and more cars took to the roads, a rise in accidents was inevitable. When one of these early cars was involved in an accident, it was not uncommon for the driver at a minimum to be injured by flying shards of glass or, far worse, lose his life after going headfirst through the windshield. The latter event was known as wearing a ‘glass necklace’. At the time some motorists filed lawsuits against car manufacturers, asserting the car makers were the cause of their windshield-related injuries leading to the development of stronger windscreens. However, in the case of *Pane v Ford, (1917)* it was alleged that the defendant's injuries were due to the vehicle's windscreen shattering upon impact. The court ruled in favour of Ford, finding he was only injured through reckless driving. Still, this caused to company to develop windshields made of laminated glass, which were introduced in 1919. There are also stories that Henry Ford and some of his closest friends were themselves injured by flying glass in accidents. Whatever the circumstances—whether personal experience with accidents, discussions with attorneys about liability issues, etc., Ford was finally convinced it was time to make car windshields safer.

⁴² *Keep the windscreen in good condition for your vehicle.* dunriteautomotiveslp.com

⁴³ A Buckboard is a 4-wheel wagon of simple construction meant to be drawn by a horse or other large animal. The Buckboard is the front-most board on the wagon that acts as both a footrest for the driver and protection for the driver from the horse's rear hooves in case of a ‘buck’. The Buckboard is steered by its front wheels which are connected by a single axle.

⁴⁴ The REO Speed Wagon was a light motor truck manufactured by REO Motor Car Company, Michigan, USA. It was an ancestor of the pick-up truck. First introduced in 1915, production continued to 1953 approximately and made REO (the initials of its founder Ransom Eli Olds) one of the better known manufacturers of commercial vehicles prior to WW11. en.wikipedia.org

Another impetus for his decision may have been one reported on by author Ford R. Bryan in his 1993 book *"Henry's Lieutenants"*. In 1918 Henry Ford saw distortion in the rear window of a Model T and decided he needed to produce improved glass. He also, however, needed less expensive glass. With more and more customers opting for enclosed vehicles, glass was harder to come by and the price of glass had risen nearly three-fold. Clarence Avery, a Ford employee, began working with Pilkington Co., a British glass manufacturer, on a new glass-making process. By the end of 1919 they had perfected a process for pouring molten glass through rollers and onto a mobile table. The table then carried the glass under several grinders and polisher until the product was finished. At Ford's extensive River Rouge Plant (Michigan) there was a steel mill, glass factory, and car assembly line. Initially Ford manufactured the glass it needed. Then, in late 1919 Ford began using laminated glass, over the next decade directing its use in all Ford cars.

Stray Light

When light travels along a path without disturbance it is called "useful light". However the light path can be disturbed causing the beam to change in some way. Light that has been disturbed is referred to as "stray light". The intensity of stray light depends on the scattering angle and the intensity of the original beam. Stray light can be generated in soiled or surface damaged windscreens. During the daylight the eye is adapted to stronger light with many different wavelengths; therefore the impact of stray light is not very severe at this time. However in the case of suddenly appearing light sources, such as on-coming headlights at night, the light that hits the windscreen can be deflected into the driver's eye by means of wide angle light scattering, causing disturbances in vision and perception. Different types of windscreen damage can result in different stray light effects. Findings from several studies suggest that stray light can have a negative impact on driver perception. A number of field and laboratory studies (some using a driving simulator) were identified that considered the effects of worn windscreens on driver perception. Some of the key findings from these studies included: Drivers may take longer to re-adapt their vision following exposure to the stray light effects created through a worn windscreen ("dazzling").⁴⁵

Types of Windscreen Damage and Stray Light

Different types of windscreen damage can result in different stray light effects.

⁴⁵ Nicola Pronk *et al* (2001). *Windscreens and Safety: A Review*. Report No. 183. Monash University Accident Research Centre. academia.edu

For example, small chips and craters tend to scatter light with a halo around the light source, while scratches and grooves tend to scatter light perpendicular to the damaged area and add one or two “tails” to the light source (*Timmermann, 1985a*).⁴⁶ A ghost image is an illusion that may appear to drivers, as a result of scattering light in a windscreen. *Timmermann (1985a)* found that light that scatters as a result of deep grooves and scratches, contributes little to the stray light index or reductions in contrast. However as the relative position of the light source moves, these defects will light up suddenly for a short time and can be irritating to drivers and may result in a loss of concentration and alertness. In the context of driving, light can be scattered as it passes through a windscreen. *Kessler (1991)*⁴⁷ suggested that stray light could be generated by soiling of the glass surfaces, surface defects, and micro-structural defects in the glass itself or in the components of laminated glass. The intensity of stray light is dependent on the intensity of the light source and the scattering angle caused by the windscreen damage or soiling (*Timmermann, 1985b*).⁴⁸

The Future - Gorilla Glass & Wiperless Windscreens

As the automotive industry engages in massive amounts of research and development, with a view towards modernizing windscreen technology – they have taken to drawing inspiration from other branches of the technology sector. Fittingly, you may be familiar with the latest development in windshield technology, as it’s already being employed in your smart phone. Gorilla Glass – the same innovative glass that is used to ensure smart phone screens are lightweight, clear and durable – is fast becoming one of the major talking points in the windscreen technology discussion. So, what exactly is Gorilla Glass? From smart phones to tablets and even watches – believe it or not, there are already approximately 4.5 billion devices worldwide that utilize Gorilla Glass. Due to its proven success, this chemically treated glass is beginning to be employed by car manufactures to ensure their windshields enjoy the same benefits of durability, lightness and clarity that have become commonplace across other industries. Gorilla Glass is created through an innovative process of dipping your windscreen in molten salt. This process prompts a chemical reaction where the sodium ions on the windscreen’s surface are replaced with potassium ions.

⁴⁶ *Direct measurement of windscreen surface wear and the consequences for road safety*. Paper presented at the Vision in vehicles. Nottingham, UK 9-13 September 1985.

⁴⁷ Kessler, F. (1991). *Light diffusion characteristics and visibility interferences in automobile windscreens*. Paper presented at the vision in vehicles – IV, University of Leiden, the Netherlands, 27-29 August 1991. Academia.edu

⁴⁸ *An instrument to measure scattered light due to windshield wear*. Paper presented at the Proceedings of the 10th International Technical Conference on Experimental Safety Vehicles.

The treated glass then becomes a middle layer, sandwiched between two layers of treated glass. This middle layer is less than a millimeter thick and can be as much as 75% lighter than its untreated counterpart. With the assistance of this groundbreaking windscreen technology – your car glass stands to be tougher, thinner and lighter than ever before. This increased durability stands to greatly reduce your windscreen’s susceptibility to damage from loose, airborne debris. Also, the reduced weight associated with this technology, means a lighter car overall and a reduction in fuel consumption. But the potential benefits don’t end there. Some predict that these innovations in car glass are the first step in irrevocably changing the role of windscreens in motoring as a whole. In fact, Gorilla Glass stands to play a crucial role in the development and implementation of integrated, interactive heads-up displays and navigation technologies in windscreens. Due to the enhanced clarity and touch screen capabilities associated with Gorilla Glass; it seems almost a certainty that, in the coming years, motorists will be faced with windscreens more akin to smart phones and tablets.⁴⁹ Here in Ireland, we know better than most the strain each winter puts on our windscreen wipers. So, the idea of a wiperless windshield is undoubtedly an enticing prospect for many. Over the last decade, several high-end car companies have been working on ways to eliminate windshield wipers entirely. Super Car manufacturer McLaren believes they have discovered the perfect solution for removing windscreen wipers from the equation. Borrowing technology developed for fighter jets, Malaren has been using ultra sonic sound to repel rain. An ultrasonic field, produced by a transducer mounted in the corner of the windscreen, produces a force field of sorts and a barrier for rain, moisture and debris. This technology is still in the research and development phase, but given the pace at which the automotive industry moves, it would not be inconceivable to see wiperless windscreens on Irish, British and European roads in the very near future.⁵⁰

Conclusion

Going to the car wash isn't just a matter of making your ride look sweet. When it comes to depth perception, it's also a matter of safety. Sure, most people realize that dirt on their windshield can hamper vision and lead to excess glare. But even a small amount of grime on your own headlights can significantly reduce their output, leading to reduced visibility at night as well as eye strain. Simply keeping your windshield and headlights dirt-free could make all the difference in the world.

⁴⁹ *The Future of Windscreen Technology*. autoglass.ie

⁵⁰ *The Future of Windscreen Technology*. autoglass.ie

A windscreen prevents external elements such rain, wind, dirt and debris from entering the car. If the windscreen is not properly placed, outside debris, rocks, trash and other unwanted elements can easily enter the vehicle and hurt you and the passengers. Just as the immune system of our body prevents foreign agents from causing harm, in a similar manner, a car's windscreen protects the car as well as the passengers. That's why it is imperative to have a well-fitted windscreen. Good visibility is essential while driving, whether it is during the day or night and having a clear view while driving is very important. Clear visibility is not just restricted to cleaning the windscreen but also checking for small cracks or other damage that might be a hindrance during the journey. If you come across a small crack on your windshield or other damage consider getting it repaired. To help keep your windscreen clean and clear, wiper blades are installed on the exterior of the car therefore; they are always exposed to harmful UV rays which reduce their lifespan. Again, consider changing them at least every year unless you do very little mileage, then bi-annually would suffice. A dirty or scratched windshield also affects the working of the wiper blades. Especially, during heavy rain, a clean windshield is advisable for a smooth functioning of the wiper blades. Hence, always make sure that the car's windshield is always clean and in good condition for the wiper blades to work properly and last longer. It is very important to clean the windshield regularly – both inside and out - as a dirty one might be damaged due to small cracks or chips. These cracks can also become enlarged. There is more to cleaning your windscreen than you might think. You might be surprised to hear just how much damage improper cleaning can do to your car glass. One of the most common errors in cleaning windshields is the use of sponges. Sponges are wholly unsuited to cleaning windshields and end up being really harmful over time, avoid them as best you can. Similarly, using towels to dry your windscreen might seem fine, but household towels are too coarse for car glass and will scratch away at the surface of your windscreen. Using a quality micro-fibre cloth and good cleaning lotion will increase the longevity of the windscreen and give you a clear, clean and unobstructed windscreen which is your view to safer driving. Finally, some sensible advice from the respected Bristol Advanced Motorists:⁵¹

- During the winter months use a glass-cutter screen cleaner regularly.
- Keep the washer bottles topped up with a good quality 50/50 screen wash - and one NOT containing silicones or waxes
- Try to keep a good pair of sunglasses in the car - they can really help

⁵¹ *Winter sun and dirty windscreens*. IAM Bristol Advanced Motorists. iam-bristol.org.uk (last accessed June 2020).

- If you can't see, do the obvious thing and slow down
- Try to be aware of where the sun is so that you are not suddenly blinded as you round a corner
- If the sun is behind you, it's in the eyes of drivers coming towards you - be aware they might not see you
- Check your windscreen wipers and be prepared to change them annually

PS

Perpetually dirty

White car of mine

Brake dust all over

So hard to make her shine

I love you

But why must you be

So hard to keep clean

I thank the heavens

That grime isn't a crime

Cause under the jail

I would thus be confined

(A clean car also adds to the personality of the person who owns it. Ed.)