National Motor Vehicle Theft Reduction Council

Review of Written-Off Vehicle Damage Assessment Criteria

May 2010

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Please note that the classification structure and damage criteria detailed in this technical working paper have been further developed and refined based on the stakeholder feedback to this Report and extensive in-field testing.

Copies of the report on the in-field testing and the NMVTRC's final recommendations can be downloaded from the publications page of our web site (www.carsafe.com.au).

The documents are—

- Review of WOV Assessment Criteria: Results of In-field Trials (August 2010)
- New Damage Assessment Criteria for the Classification of Statutory Write-offs (September 2010)

Report outline

Date	May 2010
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Title	Review of Written-Off Vehicle Damage Assessment Criteria
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Abstract

Under the national framework for the management of WOVs developed by the NMVTRC and its stakeholders any collision, fire, water or weather-event damaged vehicle declared by an insurer (or self-insurer) to be a total loss must be classified to be either a *Statutory* (SWO) or *Repairable* (RWO) write-off.

Under the current regime a SWO may only be sold subject to a statutory restriction that it may only be used for parts or scrap metal. A RWO may be repaired and re-registered subject to the vehicle passing specific safety and identification inspections. A set of technical criteria determine when a WOV should be classified an SWO.

The current criteria were developed by the New South Wales Roads and Traffic Authority in the mid-1990s. Changes in vehicle construction over recent years and the rapid acceleration in the use of new and composite materials mean that it is increasingly more complex to assure a complete and safe repair of a modern vehicle. Vehicle manufacturers have also expressed concern about the hazard posed by the delayed corrosion of key electronic components—including primary safety systems—in respect of immersed vehicles.

A national workshop of NMVTRC key stakeholders in June 2009 resolved that the current criteria were in need of urgent updating to reflect these changes and to make the system more impervious to manipulation by criminal networks and fraudsters.

Delta V Experts was engaged to work with affected parties to develop new draft criteria which meet the system's current and future needs. This Report outlines the preliminary development of the criteria with a select group of stakeholders in order to produce an *exposure draft* for broader consultation.

Purpose

To review the national assessment criteria for the classification of WOVs taking account of the significant changes in vehicle design, construction and repair techniques since the original criteria were set, to ensure that vehicles which should not be repaired on safety grounds are classified appropriately

Key words Written-off vehicles, Statutory Write-off, Repairable Write-off

Summary

An effective system for the management of written-off vehicle (WOV) identities is a core element of Australia's integrated strategy to combat the activities of organised vehicle criminals. Under the national framework developed by the National Motor Vehicle Theft Reduction Council (NMVTRC) and its stakeholders any collision, fire, water or weather-event damaged vehicle 15 years old or under declared by an insurer (or self-insurer) to be a total loss must be classified to be either a *Statutory* (SWO) or *Repairable* (RWO) write-off.

Under the current regime an SWO may only be sold subject to a statutory restriction that it may only be used for parts or scrap metal. An RWO may be repaired and re-registered subject to the vehicle passing specific safety and identification inspections. A set of technical assessment criteria determine when a WOV should be classified an SWO.

The current criteria were based on those developed by the New South Wales Roads and Traffic Authority in the mid-1990s. Changes in vehicle construction over recent years and the rapid acceleration in the use of new and composite materials mean that it is increasingly more complex to assure a complete and safe repair of a modern vehicle. Vehicle manufacturers have also expressed concern about the hazard posed by the delayed corrosion of key electronic components—including primary safety systems—in respect of immersed vehicles.

In June 2009, the NMVTRC—with the co-operation of Austroads[1]—hosted a national workshop in response to concerns that current government and industry WOV processes are continuing to be manipulated by criminals to launder rebuilt repairable write-offs (RWOs) constructed with stolen parts. The Workshop resolved that the current criteria were in need of urgent updating to reflect the changes in vehicle design and construction and make the system more impervious to manipulation by criminal networks and fraudsters.

The NMVTRC engaged Delta-V Experts (DVE) to review the existing SWO criteria from a vehicle safety perspective. DVE was assisted by an Expert Reference Group of affected parties established especially for this purpose by the NMVTRC. The ERG comprises twenty-one stakeholder representatives drawn nationally from a cross-section of transport agencies, police, insurers, and the motor trades. Discussions were also held with a range of other select organisations with an interest in related issues and noted the findings of a companion NMVTRC project auditing the consistency of assessments under the current regime conducted by former insurance assessing executive, Allan Gribble (refer Gribble[2]).

Based on these discussions and its own technical analysis, DVE is of the view that both the classification hierarchy and individual criteria require modification to better meet their intended objectives. DVE proposes a national system which includes four categories—

1. "Economic Write-off" (EWO): comprising stolen and recovered vehicles subject to malicious damage, hail damaged vehicles, smoke damaged vehicles etc., which are not structurally damaged and do not meet any of the other statutory write-off criteria.

2. "Repairable Write-off" (RWO): vehicles which are damaged but only meet one or two of the eight revised damage criteria.

3. "Statutory Write-Off" (SWO): vehicles which meet three or more of the structural damage criteria or any of the other statutory write-off criteria.

4. "Collectable or High Personal Value Write-off" (CHPV): vehicles which can be sold by the insurer back to the insured owner.

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[1] Austroads is the national association of road transport and traffic authorities.

[2] Gribble A., 'Audit of Written-off Vehicles Sold at Auction', National Motor Vehicle Theft Reduction Council March 2010

DVE proposes that a vehicle be classified as an SWO if:

- Three or more of a possible eight structural criteria are exceeded; or
- The vehicle is damaged by fire, such that structural parts of the vehicle are possibly compromised; or
- The vehicle is immersed in water (fresh, salt and/or brackish) for any period of time, such that the electronics and/or wiring are possibly compromised; or
- The vehicle is stripped.

The parties consulted by DVE also made a number of observations about inconsistencies in the administration of the current system that need to be addressed in either the companion project on improving WOV safety and identity inspection standards or separately in implementing any new national policy. Such matters include—

- assuring better compliance by self-insurers and the inclusion of passenger and light commercials used on mining sites;
- the consistent treatment of heavy vehicles, trailers, caravans and end-of-life vehicles in the national WOV regime;
- assessors competency standards and training;
- the supervision and certification of repairs by independent engineering experts; and
- consumer information needs.

Please note that the classification structure and damage criteria detailed in this technical working paper have been further developed and refined based on the stakeholder feedback to this Report and extensive in-field testing.

Copies of the report on the in-field testing and the NMVTRC's final recommendations can be downloaded from the publications page of our web site (www.carsafe.com.au).

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Acknowledgements

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Mark Borlace (Chair)	NMVTRC Councillor/Australian Automobile Assoc/RAA SA
Allan Bewley	Department of Transport, Energy and Infrastructure (SA)
Morry Corvasce	Victorian Automobile Chamber of Commerce
Sean Dempsey	Suncorp Metway
Tony Dorosz	West Australian Police Service
Colin Duckworth	Motor Trades Association of Australia
Campbell Jones	Manheim-Fowles
Phil Marks	QBE Insurance
Trevor Maughan	Department of Transport (WA)
Daren McDonald	Roads and Traffic Authority (NSW)
Robert McDonald	Insurance Australia Group
Chris McNally	VicRoads
Will Morgan	Pickles Auctions
Greig Newbery	New South Wales Police
Tony Phillips	RAA Insurance (SA)
John Pinney	Victoria Police
Gerry Raleigh	Accident Solutions
Laurie Ratz	Insurance Council of Australia
David Smith	Motor Trades Association of NSW
Wayne Stapylton	Allianz Insurance
Keith Watts	Department of Transport and Main Roads (Qld)

Other parties consulted in the development of this Report included Richard Pratt (I-CAR Australia) and James Hurnall (Federal Chamber of Automotive Industries).

Contents

1. Introduction

The NMVTRC engaged DVE to review the existing SWO criteria from a vehicle safety perspective. The objective was to—

- in consultation with affected parties—re-evaluate the current assessment criteria to take account of changes in design and repair techniques to ensure that vehicles which should not be repaired on safety grounds are classified appropriately; and

- develop recommendations for a new set of criteria that achieve that end.

DVE was assisted by an Expert Reference Group of affected parties established especially for this purpose by the NMVTRC. The ERG comprises twenty-one stakeholder representatives drawn nationally from a cross-section of transport agencies, police, insurers, and the motor trades. Discussions were also held with a range of other select organisations with an interest in related issues. This report was reviewed by the ERG in early May.

The balance of Section 1 of the Report sets out some of the basic considerations and environmental factors which influenced the Review. This includes—

- a description of the current criteria and classification process;

- a discussion of the relative design characteristics of 1980-1990s vehicles with their successors; and

- alternative options considered in developing the proposed method of approach.

Section 2 discusses in detail why in key areas the current criteria are adjudged to be deficient and outlines how they may be modified to better meet the system's needs.

Section 3 details the recommended classification hierarchy and the detailed criteria for assessing impact, fire and water damage and vehicles that have been stripped of parts.

Section 4 summarises the observations of parties consulted about inconsistencies in the administration of the current system that need to be addressed in either the NMVTRC's companion project on improving WOV safety and identity inspection standards or separately in implementing any new national policy.

1.1 The current procedures

The existing SWO criteria was developed in the mid-1990s initially in New South Wales by the Roads and Traffic Authority and later adopted by the NMVTRC and the other jurisdictions as the 'national' criteria.

A vehicle declared by an insurer to be a total loss must be assessed against a set of technical criteria to determine its status as a RWO or SWO. A SWO may only be sold subject to a statutory restriction that it may only be used for parts or scrap metal. A RWO may be repaired and re-registered subject to the vehicle passing specific safety and identification inspections. The current assessment criteria cover impact, fire and water damage and the deliberate stripping of parts.

The existing criteria represent a good starting position and the fundamental basis for the criteria when first developed was sound. However, there are weaknesses with the existing system. They include—

- The structural damage criteria—
  - which is open to interpretation, has resulted in vehicles that are suitable only for dismantling being classified as RWOs (refer to Gribble[3]).

    Vehicle rollover crashes were identified by some members of the ERG as a crash type that does not explicitly get identified within the current criteria. Rollover crashes can result in damage to multiple pillars and the vehicle roof. An interpretation of the current criterion is that rollover damage to the roof and pillars can be collectively interpreted as meeting only one of the three required areas of damage for an SWO classification.

  - rely heavily on the training, skill and experience of the assessors to appropriately interpret the criteria.

    In the discussions held with some representatives of the insurance industry and others during the ERG meetings, the lack of a recognised qualification for a vehicle 'assessor' was discussed. The larger insurers identified a preference for recruiting assessors with an automotive repair trade background and who in most cases, required supplemental training. It is also common for insurers to use outsourced service providers whose employees' skill sets are not within the insurer's direct control.

    (There are organisations and associations which provide assessors with on-going training and development. Greater co-ordination in curriculum development between these organisations and associations would assist to improve consistency.)

  - have not maintained pace with advances in vehicle manufacturing techniques such as the use of boron steel, laser welding and/or composite construction. It is possible that a boron steel member could be catastrophically damaged with a damage area less than the current 300mm x300mm requirement.

    The current vehicle roof, firewall and floor panels are structural elements in a modern vehicle. Janas Bernquist illustrated this in his presentation on the design of the Volvo XC90, at the "Great Designs in Steel Seminar" by Autosteel in 2004[4]. The presentation details that:

    - *"A rigid framework surrounding the occupants creates support for the interior safety equipment and provides a survival space for the vehicle occupants in case of a crash".*
    - The Side Impact Protection System has existed since 1991 and minimises the intrusion by, amongst others, "*transverse floor/roof members*".
    - The front structure includes the "*cross member firewall*".
    - Figure 1 is extracted from the Berquist presentation and illustrates the different structural steels used in the Volvo XC90. Note that the roof, firewall and floor pan are included as structural elements and that they are reinforced by higher strength steels.

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[3] Gribble A., 'Audit Of Written-Off Vehicles Sold At Public Auction' National Motor vehicle Theft Reduction Council March 2010

[4] Bernquist J., (2004) Safety Cage Design in the XC90, Presentation to the 'Great Designs in Steel Seminar', www.citizen.org/documents/ACF48DD.pdf

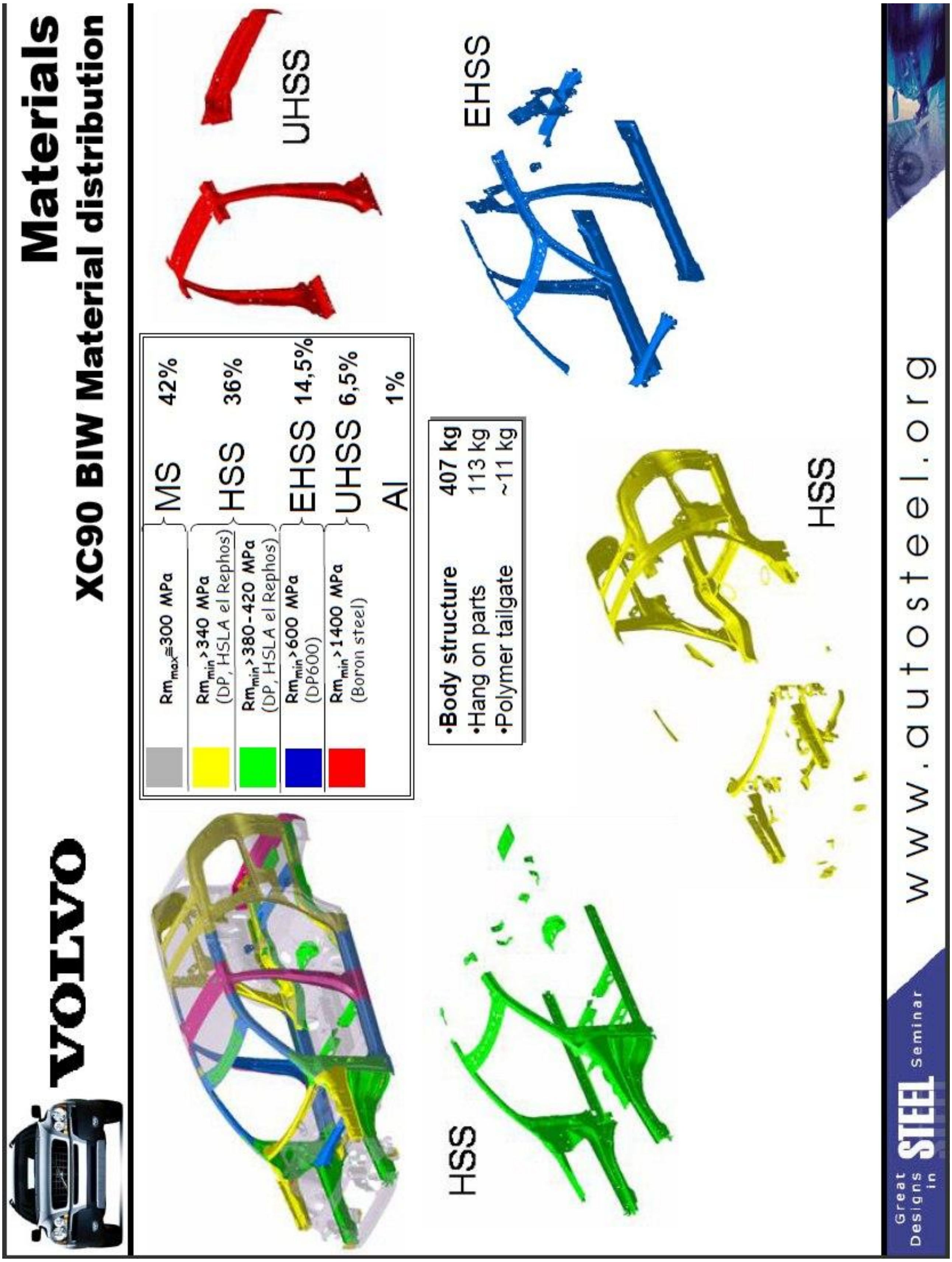

Figure 1: Extract from Berquist presentation illustrating the different structural steels used in the Volvo XC90. Note that the roof, firewall and floor pan are included as structural elements, reinforced by higher strength steels.

  - defines an area amount of damage to be sustained to the roof turret, floor pan and firewall, rather than defining an amount of damage which is unacceptable from a safety perspective per se.

  - does not define damage to the structural rails/chassis of the vehicle or to the suspension attachment points.

  - does not utilise the deployment of airbags as an indicator of severe loading of the vehicle structure.

- There are no detailed criteria for the amount of acceptable fire damage.

- There is a difference in the current criteria between a vehicle immersed in salt water as opposed to fresh water. A vehicle immersed in salt water up to the door sills is a SWO, whereas a vehicle submersed in fresh water up to the dash for less than 48 hours can be a RWO. Of course when the current criteria were developed the positioning of key electrical and electronic system were limited to the under dash area. However, in current vehicles such systems are distributed all over the vehicle, including as low as the cabin floor. As a consequence, the water resistance or water proof properties of such systems require validation.

An advantage of the existing criteria is its relative simplicity.

1.2 Vehicle manufacture

Under Australia's hierarchy of vehicle safety regulation, the Motor Vehicle Standards Act and Australian Design Rules (ADR) administered by the Australian Government set national standards for new vehicles supplied to the market. Once a vehicle is in service, the Australian Vehicle Standards Rules, as implemented in each state or territory require the vehicle to continue to comply. This translates to the need for a damaged vehicle to be repaired in accordance with the original manufacturer's recommendations to ensure it continues to meet safety standards.

McIntosh[5] (1998) states that the: "*Australian fleet is ageing with the average vehicle over ten years old*". Anderson et al[6] (2009) identified that the mean age of the Australian passenger car fleet was 9.9 years. It can be inferred that when the existing SWO criteria was developed, it was based on the Australian vehicle fleet at the time ie late 1980s or early 1990s.

The design, manufacturing methods and electronics used in the majority of vehicles within the Australian fleet[7] at that time could be characterised as—

- The fundamental vehicle structure would have been manufactured from press formed steel panels. The steel panels would have had a yield stress of 200MPa to 350MPa, and there would have been limited uses of high strength steels or other materials. The steel panels would be spot welded together.

- Crashworthiness requirements focused on the design and compliance of components within the vehicle such as:

  - Seats and Seat Anchorages Australian Design Rule (ADR 3).

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5 McIntosh L (1998), 'The ageing of the Australian car fleet and occupant protection', 98-S6-O-13, The 16th International Technical Conference on the Enhanced Safety of Vehicles, Windsor, Ontario, Canada, 31 May – 4 June 1998.

6 Anderson R. W. G., Doecke S., Searson D., 'Vehicle age-related crashworthiness of the South Australian passenger fleet' Centre for Automotive Safety Research, Report CASR062, July 2009

7 The reference vehicles for the Australian fleet late 1980s early 1990s would be the Holden VN Commodore and/or the Ford EA Falcon.

  - Seatbelts ADR 4.
  - Steering Column ADR 10.
  - Side Door Strength ADR 29.
- The electronics would be limited to the engine management system.

From circa 2000, the design, manufacturing methods and electronics used in the majority of vehicles within the Australian fleet[8] could be characterised as—

- The fundamental vehicle structure is manufactured from formed parts.
  - The majority of metal parts are pressed, however hydro-forming is used to create some formed parts.
  - There is a range of steel used which have yield stresses which range from 150MPa to over 800MPa.
  - Structural foam and structural plastics are increasingly used.
  - The bonding techniques used in vehicles to connect structural elements include:
    - Spot welding.
    - Fasteners.
    - Adhesives.
- The crashworthiness requirements have increased to include evaluations of the vehicle as a whole system:
  - Full Frontal Impact Occupant Protection ADR 69 (48km/h impact by the test vehicle into a rigid barrier).
  - Dynamic Side Impact Occupant Protection ADR 72 (either: a 50km/h side impact by a 950kg deformable barrier into a stationary vehicle or a 54km/h 27° crabbed side impact by a 1360kg deformable barrier into a stationary vehicle).
  - Australasian New Car Assessment Program (ANCAP):
    - Full Frontal (56km/h impact by the test vehicle into a rigid barrier).
    - Frontal Offset (64km/h impact by a test vehicle with a 40% overlap into a deformable barrier).
    - Side Impact (50km/h side impact by a 950kg deformable barrier into a stationary vehicle).
  - Vehicle manufacturers have developed criteria to simulate vehicle collision and to conduct crash tests.

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8 The reference vehicles for the Australian fleet circa 2000 would be the Holden VX Commodore and/or the Ford AU Falcon.

- Electronics are used extensively in engine management, transmission control, traction control, braking systems (Anti-lock Brake Systems (ABS)), airbag and seatbelt pre-tensioner deployment.

In 2010, the design, manufacturing methods and electronics used in the majority of vehicles could be characterised as—

- The fundamental vehicle structure is manufactured from formed parts.
  - The majority of metal parts are pressed, however hydro-forming is a technique which is also used to create formed parts.
    - Tailored rolling is a new technique which allows smooth and quick transitions from one thickness to another. It involves creating a blank with various thicknesses which are then pressed or formed into the final shape.
  - There are a range of metals (Steel and/or Aluminium) used which have yield stresses which range from 150MPa to over 1000MPa.
  - Structural foam and structural plastics are now commonly used. The foams and plastics can be using in isolation, in combination with one another or the structural metals.
  - The bonding techniques used in vehicles to connect structural elements include:
    - Spot welding.
    - Laser welding.
    - Fasteners.
    - Adhesives.
- The crashworthiness requirements have increased to include evaluations of the vehicle as a whole system:
  - Full Frontal Impact Occupant Protection ADR 69 (48km/h impact by the test vehicle into a rigid barrier).
  - Dynamic Side Impact Occupant Protection ADR 72 (either: a 50km/h side impact by a 950kg deformable barrier into a stationary vehicle or a 54km/h 27° crabbed side impact by a 1360kg deformable barrier into a stationary vehicle).
  - Offset Frontal Impact Occupant Protection ADR 73 (56km/h impact by a test vehicle with a 40 per cent overlap into a deformable barrier).
  - ANCAP conducts 4 internationally recognised crash tests:
    - Frontal Offset (64km/h impact by a test vehicle with a 40 per cent overlap into a deformable barrier)
    - Side Impact (50km/h side impact by a 950kg deformable barrier into a stationary vehicle)
    - Pole Test (29km/h side impact by a test vehicle mounted on a trolley into a rigid pole)
    - Pedestrian (40km/h impact)

    - Vehicle manufacturers have developed criteria to simulate vehicle collision and to conduct crash tests.

- Electronics are used extensively in engine management, transmission control, braking systems (ABS, brake for distribution), collision avoidance (Electronic Stability Control), airbag and seatbelt pre-tensioner deployment, parking assistance (proximity sensing, reversing cameras), seat positioning, driver information display, tyre pressure sensors, etc.

The fundamental changes which have and are occurring in the Australian passenger vehicle fleet from the late 1980s to present are:

- Move to using:
    - More high strength, ultra high strength and boron steels to achieve improved structural performance and/or to reduce mass.
    - Composite structures (combination of metals, foams, plastics and other materials).
- Increasing use of electronics.
- Increasing consumer, manufacturer and regulatory requirements for safety.
- Environmental impacts on the build, operation and disposal.

The next five to ten years are likely to see even more rapid introduction of composite materials, foams and lightweight metals in key structural components, and increasingly complex electronics to deliver intelligent transport system applications. Any new SWO criteria need not only to address the existing Australian passenger vehicle fleet but the future vehicle fleet to ensure that it remains relevant.

1.3 Initial Consideration

An initial consideration by DVE was to create an evaluation system based on rating classes of vehicles by their relative safety-related design characteristics, eg Class A, B, C etc. The individual criteria would be based on a vehicle's crash performance and methods of manufacture. Within the classes there would be different levels of sustainable damage criteria for different types of collision, such as:

- A lateral pole impact to the driver side door:
    - A 2010 Audi TT could sustain up to 120mm deformation to the vehicle body in a lateral pole impact yet still be structurally sound, whereas
    - A 1998 Holden Commodore could sustain 380mm deformation to the vehicle body in a lateral pole impact and be structurally sound.

To support such an approach a database would be required to correlate the vehicle (make, model and year), collision type (full frontal, frontal offset, frontal narrow object, side, side offset, side narrow object, full rear, rear offset, rear narrow object, rollover and other) and damage criteria. For thirty different vehicle makes, each producing on average twenty-five different models over a fifteen year period, there would be 750 vehicles each requiring criteria for the eight different identified collision types, which equates to 8,250 individual criteria.

However, this approach was discounted on grounds of its relative complexity. An alternative to classify vehicles using the New Car Assessment Program (NCAP) used by Australia, Europe, United States of America and Japan was also rejected on the basis that a separate process would be required to classify any vehicle not tested by NCAP and the collision type is not evaluated by NCAP (ie frontal narrow object, side offset, all rear impacts and rollover). The advice from the ERG was that if the system was not easy to use then it would not be practicable.

2. Discussion

2.1 The structural damage criteria

In three of the existing five impact damage indicators (Roof (turret), Floor pan (cabin area) and Firewall) a 300mm by 300mm (or more) area is defined as an indicator of damage. Whilst a 300mm by 300mm area of damage may represent significant structural damage for one type of vehicle, for another, it may not.

Indicators of structural loading are bending, fracturing, cutting, cracking, buckling and/or material folding over onto itself.

The identification of structural damage needs to expand from only allowing one area of significant structural damage per vehicle element (roof, floor pan, firewall and suspension) to allow for the possibility of multiple areas of significant damage ie, if there is structural damage to three separate suspension stations, they should be assessed to be three distinct areas of damage rather than just one for the suspension as a whole.

2.1.1 Roof

The current criteria specifically identify the vehicle roof as an area which can indicate impact damage. In some States and Territories the turret is also included.

The pillars on a modern vehicle are integral to the fundamental structural performance of the vehicle in forward, side and rollover collisions. The exclusion of the vehicle pillars in the current criteria is a weakness. An example of the weakness is—

> Consider a vehicle which is involved in a collision such that the emergency services cut both A and B pillars, so that the roof can be folded back to allow extraction of the vehicle occupants. An interpretation of the current criteria is that the vehicle has sustained damage to only one of the three possible criteria. Having both A and B pillars cut and the roof deformed will structurally compromise the vehicle. The only effective repair is to replace both A and B pillars and the roof. Reattaching the cut and bent elements will result in a cosmetic repair, but will not provide an effective structural repair.

The roof and the pillars should be separated into different impact damage indicators, with damage to the roof and to individual pillars considered as separate indicators of structural damage. Hence structural damage to the roof and two pillars or damage to three pillars would each represent three areas of structural damage.

There has been an increase in the number of vehicles with glass roofs. Some members of the ERG queried whether such vehicles required special consideration. However, DVE is not aware of any sound technical reason why they should be excluded as a possible indicator of structural impact damage.

2.1.2 Floor pan

Damage to the vehicle floor pan should continue to be an indicator of structural loading.

2.1.3 Firewall

Damage to the vehicle firewall should continue to be an indicator of structural loading.

2.1.4 Longitudinal structural rails/chassis

The design of vehicles has significantly improved from the early 1990s such that an NCAP crashed 5 star vehicle has limited damage to the firewall but significant damage to the forward structural rails/chassis. In a longitudinal collision, the structural rails of the vehicle control the amount of deformation. The current criteria do not address this major transformation in vehicle design and the longitudinal structural rails/chassis should be considered to be a critical structural element in their own right.

Damage to an individual longitudinal structural rail should be counted as an individual area of structural damage and hence damage to two longitudinal structural rails would account for two areas of structural damage.

2.1.5 Suspension

The current criteria for the suspension should be modified.

The current criterion groups all suspension damage as one indicator of damage. The grouping of all suspension damage into one in the current criteria is a weakness. An example of this weakness is—

> Consider a Ford Falcon XR6 utility which has slid sideways such that the front right wheel, the front left wheel and rear axle assembly are ripped off the vehicle. Using the current criteria this would count as one indicator of damage, when there have clearly been three.

The damage to independent suspension units and/or to connected axles should be considered as each representing an indicator of damage.

Damage to the suspension mountings was also considered as a separate indicator of damage in addition to the suspension. However, a review of damaged vehicles failed to illustrate effective examples of intact suspensions and damaged suspension mountings.

2.1.6 Mechanical components

The current criteria for the mechanical components should be retained as an indicator of damage.

2.1.7 Supplementary restraints

There were various discussions with ERG members about the deployment of airbags as an indicator of significant structural loading of the vehicle. DVE would accept that in the early to mid-1990s airbag deployment may not have been a good indicator of impact severity. However, the proliferation and current understanding of triggers for airbags has improved such that the airbag is part of an overall vehicle safety system (structure, active restraints and passive restraints).

The current intent of airbags is that they deploy to protect the vehicle occupants when the vehicle is involved in a severe collision such that the structure has been dynamically structurally loaded beyond the capacity of just the seatbelt restraints[9]. It also needs to be recognised that the manufacturers of the majority of vehicles equipped with airbags will have spent considerable effort in designing, testing and evaluating the effect and trigger for the deployment of airbag(s).

The deployment of airbags (frontal, side and/or curtain) is defined by the vehicle manufacturer and indicate that the vehicle has been structurally loaded. Airbag deployment should therefore be used as an overall indicator of damage.

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[9] The following is extracted from Autoliv's web site: "*Airbags are among the most important automotive safety products, since the concept of inflating a textile cushion could be used in both frontal impacts and side impact collisions to protect a great variety of body parts. In frontal impacts, for instance, driver airbags are estimated to reduce fatalities by 25% for belted drivers and serious head injuries by over 60%. For front-seat passengers (that are further away from the instrument panel than a driver from a steering wheel) the protective effect is estimated to be 20%.*

In side impacts curtain airbags are estimated to reduce the risk for life-threatening head injuries when occupants are sitting on the side of the vehicle that is struck, while thorax airbags reduce serious injuries to the chest by approximately 25% in side-impact collisions. There is also an increasing demand for knee airbags and anti-sliding airbags, because frontal airbags and modern seatbelts have reduced the risk for head injuries but not the injuries to the legs. Consequently, there is a growing focus on using airbags to also prevent long-term disabling leg injuries. It is important that people not only survive crashes but also are able to walk, and lead a normal life."

(http://www.autoliv.com/wps/wcm/connect/autoliv/Home/What+We+Do/Airbags)

2.2 The fire damage criteria

The current fire damage criteria are vague and open to significant interpretation.

Smoke only damage to a vehicle will not cause a safety concern. Smoke only damage to a vehicle should be addressed outside of the RWO and SWO criteria altogether.

Fire damage to non structural panels ie, doors, bonnet, boot and quarter panels are not sufficient to meet the SWO criteria.

Currently, significant numbers of vehicles are manufactured from high and ultra-high strength steels, aluminium, foams and/or composite materials and their use is increasing. These materials are susceptible to structural degradation when exposed to heat from a fire.

Structural fire damage can be caused internally (engine, cabin and/or boot) and/or externally (adjacent vehicle, building or bush).

The existing criteria need to be modified to specifically accommodate structural fire damage. The structure of the vehicle would be defined as the roof, pillars, floor, firewall and or structural rails/chassis. How best to assess the intensity of the fire was discussed extensively with members of the ERG.

Blistering of the paint was considered to be a pragmatic and practical method to assess if sufficient heat had been transferred into the vehicle structural elements to cause structural degradation of high and ultra-high strength steels, aluminium, foams and/or composite materials.

2.3 The water damage criteria

Members of the ERG were able to identify that the existing salt water criteria was based on the corrosive characteristics of salt water on the vehicle structure. Discussions identified that a limitation of the current criteria was immersion in brackish water and the effect of fresh water on current electronics and wiring.

It is presumed that the fresh water immersion for 48 hours up to the dash/steering wheel was due to the majority of electronics, electrics and/or pyrotechnic safety systems being located above this level. Current vehicles have electronic, electrical and pyrotechnic safety systems on or near the vehicle floor.

The discussion within the ERG focused on obtaining credible information about the water resistance, water proofing and/or depth of immersion build standard of vehicle electronic, electrical and pyrotechnic safety systems.

The question of water resistance was raised directly with the vehicle manufacturers. In his response on behalf of manufacturers Mr Hurnall[10] advised that: "*The industry considers that any immersion in fresh water would adversely affect electronics/wiring. Consequently, the criteria for fresh water immersion should reflect that for salt water immersion, i.e. "If the vehicle is immersed in salt/fresh water above the door sill level ….for any period the vehicle must be classified as a SWO."*"

The equipment manufacturer's representatives with whom DVE discussed this issue also confirmed that whilst the electronic, electrical and pyrotechnic safety systems may be resistant to water spray they are not designed to be immersed.

The exiting criteria need to be modified to accommodate the immersion of electronic, electrical and pyrotechnic safety systems.

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10 Mr James Hurnall, Director – Technical & Regulatory, Federal Chamber of Automotive Industries

3. Statutory Write-off (SWO) Criteria

3.1 Write-off Categories

Currently an insurer, having determined that they do not want to repair the vehicle and/or cannot repair the vehicle economically, has an option to declare the vehicle to be a "repairable" or "statutory" write-off.

DVE propose a national system which includes four categories:

1. "Economic Write-off" (EWO): vehicles including stolen and recovered vehicles, hail damaged vehicles, smoke damaged vehicles etc., which are not structurally damaged and do not meet any of the other statutory write-off criteria;

2. "Repairable Write-off" (RWO): vehicles which are structurally damaged but only meet one or two of the nine revised damage criteria;

3. "Statutory Write-off" (SWO): vehicles which meet three or more of the structural damage criteria or any of the other statutory write-off criteria;

4. "Collectable or High Personal Value Write-off" (CHPV): vehicles can be sold by the insurer back to the insured owner.

3.2 Suggested SWO Criteria

3.2.1 Structural Criteria

The existing structural criteria should be expanded from five to eight criteria, with the requirement that once a vehicle has received damage to any three of the identified structural areas and/or supplementary restraints it is deemed a SWO.

1. Roof

   The criteria to be used for item 1 (Roof) is that if the Roof has been loaded such that individual structural element(s)/member(s) have been structurally: fractured, cut, cracked, buckled and/or is folded over onto itself, then the Roof has an area of structural damage.

2. Pillars

   The criteria to be used for item 2 (Pillars) is that if the Pillar(s) have been loaded such that an individual structural element has been structurally: fractured, cut, cracked, buckled and/or is folded over onto itself, then the Pillar has an area of structural damage. Each pillar counts separately ie, if three pillars are structurally damaged then based on the pillar damage alone the vehicle would have three areas of structural damage. Hence, the vehicle with three damaged pillars would be classified as a SWO.

3. Floor pan

   The criteria to be used for item 3 (Floor pan) is that if the Floor pan has been loaded such that individual structural element(s)/member(s) have been: fractured, cut, cracked, buckled and/or is folded over onto itself, then the Floor pan has an area of structural damage. If different and unconnected areas of damage are identified each area counts separately ie, damage under the driver's seat and damage under the rear passenger side seat would represent two areas of structural damage. Hence the vehicle would require only one other area of structural damage to be classified as a SWO.

4. Firewall

   The criteria to be used for item 4 (Firewall) is that the structure has been loaded such that an individual structural element(s)/member(s) have been: fractured, cut, cracked, buckled and/or is folded over onto itself, then the Firewall has an area of structural damage. If different and unconnected areas of damage are identified, each area counts separately.

5. Longitudinal structural rails/chassis

   The criteria to be used for item 5 (Longitudinal structural rails/chassis) is whether the longitudinal rails/chassis has been structurally loaded such that longitudinal structural element(s)/member(s) have been structurally: fractured, cut, cracked, buckled and/or is folded over onto itself.

   Each longitudinal structural rail counts separately ie, if two longitudinal structural rails are buckled and the front right suspension is damaged the vehicle would have three areas of structural damage and thereby be classified as a SWO.

6. Suspension

   The criteria to be used for item 6 (Suspension) is whether there has been any collision induced damage to any of the suspension components: axles, control arms, steering linkages, springs and dampers (shock absorbers).

   Independent suspension units and connected axles count separately ie, if two axle lines (front and rear) are torn away from the vehicle and one of the pillars is buckled, the vehicle would have three areas of structural damage and be classified as a SWO.

   If two rear and one front independent suspensions are ripped off there would be three areas of structural damage and the vehicle should be classified as a SWO.

7. Mechanical components

   The criteria to be used for item 7 (Mechanical components) is whether there has been any collision induced damage to the: steering system, engine block, transmission case, differential case(s) and axle housings such that the items are cracked, deformed and/or broken.

8. Supplementary restraints

   The criteria for item 8 (Supplementary restraints) is whether there has been any deployment of either an airbag (frontal, side and/or curtain) system within the vehicle occupant cabin and/or the activation of a seatbelt pre-tensioner.

3.2.2 Fire Criteria

The fire damage SWO criteria should be expanded to consider the following: in-vehicle (engine compartment, occupant cabin and/or boot) and external. A fire (whether in-cabin or external) which causes the internal and/or external paint to blister on the roof, pillars, floor, firewall and or structural rails/chassis shall be deemed a SWO. Paint blistering on the doors and/or the external panels is not sufficient for the vehicle to be classified a SWO.

3.2.3 Water Damage Criteria

The water damage SWO criteria should be as follows:

- When a vehicle is immersed in any water (fresh, salt and/or brackish water) above the level of the door sill for any period.
    - Specific individual vehicles which are designed and/or developed to be immersed should be considered on a case by case basis, ie, Landrover Defender.
- When a motorcycle is fully immersed in fresh, salt and/or brackish water for any period.

3.2.4 Vehicle Stripping Criteria

If stripped, the vehicle should be an SWO if the value of the removed parts, panels and/or components makes the vehicle economically unviable to repair.

4. Additional Information and Comments

The following additional questions and comments, which are outside the scope of this assignment, were gathered from ERG members during the consultation process. They are included as stakeholder observations, rather than recommendations, for consideration by the NMVTRC in the companion project on improving WOV safety and identity inspection standards, or separately in implementing any new national policy:

- The responsibility and authority of each of the ‘actors’ in the decision or logistics chain needs to be developed to remove current ambiguities with respect to who makes the call that the vehicle is a Statutory Write-off (SWO):
    - Whilst a vehicle may meet the SWO criteria, it may also be able to be effectively and correctly repaired by the insurer. Hence it is the insurers’ right to decide what to do with the vehicle either repair it or write the vehicle off.
    - The process to write-off or SWO a vehicle only occurs after the insurer has determined that they do not want to repair the vehicle and/or cannot repair the vehicle economically.
- The $100,000 PAV exception on the New South Wales criteria should be removed, as it is no longer relevant as a discriminator for exotic vehicles.
- Why are vehicles such as trucks, those used on mining sites, trailers and caravans not treated consistently in all jurisdictions?
- Why are vehicles which are crushed, not reported or listed on the WOVR?
- Insurance assessors should demonstrate a level of competency and be controlled or licensed. The skills and understanding of the insurance assessors needs to be maintained.
- Vehicles which are Repairable Write-offs (RWO) should be:
    - Repaired under the supervision of a road authority endorsed engineer. The engineer must inspect the vehicle prior to repairs commencing, to ensure that only one or two of the nine damage criteria are met. The engineer shall endorse that:
        - The manufacturer specified methods were used to conduct the repair.
        - The repairer is trained in the manufacturer’s repair techniques.
        - The repairer is competent in the aforementioned repair techniques.
    - The engineer must produce a full documented report detailing the damage, repairs, method of repair and testing conducted to prove that the vehicle is structurally sound post-repair, e.g. torsional rigidity testing, point to point measurements, etc. The engineer shall also certify the repair.

For all RWOs, the annual vehicle registration label should be permanently marked with “RWO” or similar, so that subsequent buyers can be informed immediately that the vehicle was a RWO and know to ask for the engineering report.

The NEVDIS system should be more easily, openly accessible to identify if a vehicle has been written off so that warranty claims can be checked.

Appendix A – Photographic Examples of Suggested SWO Criteria

Figure 2: Illustration of damage to a vehicle roof such that the roof windscreen and door headers are structurally deformed as well as the A, B, C and D pillars.

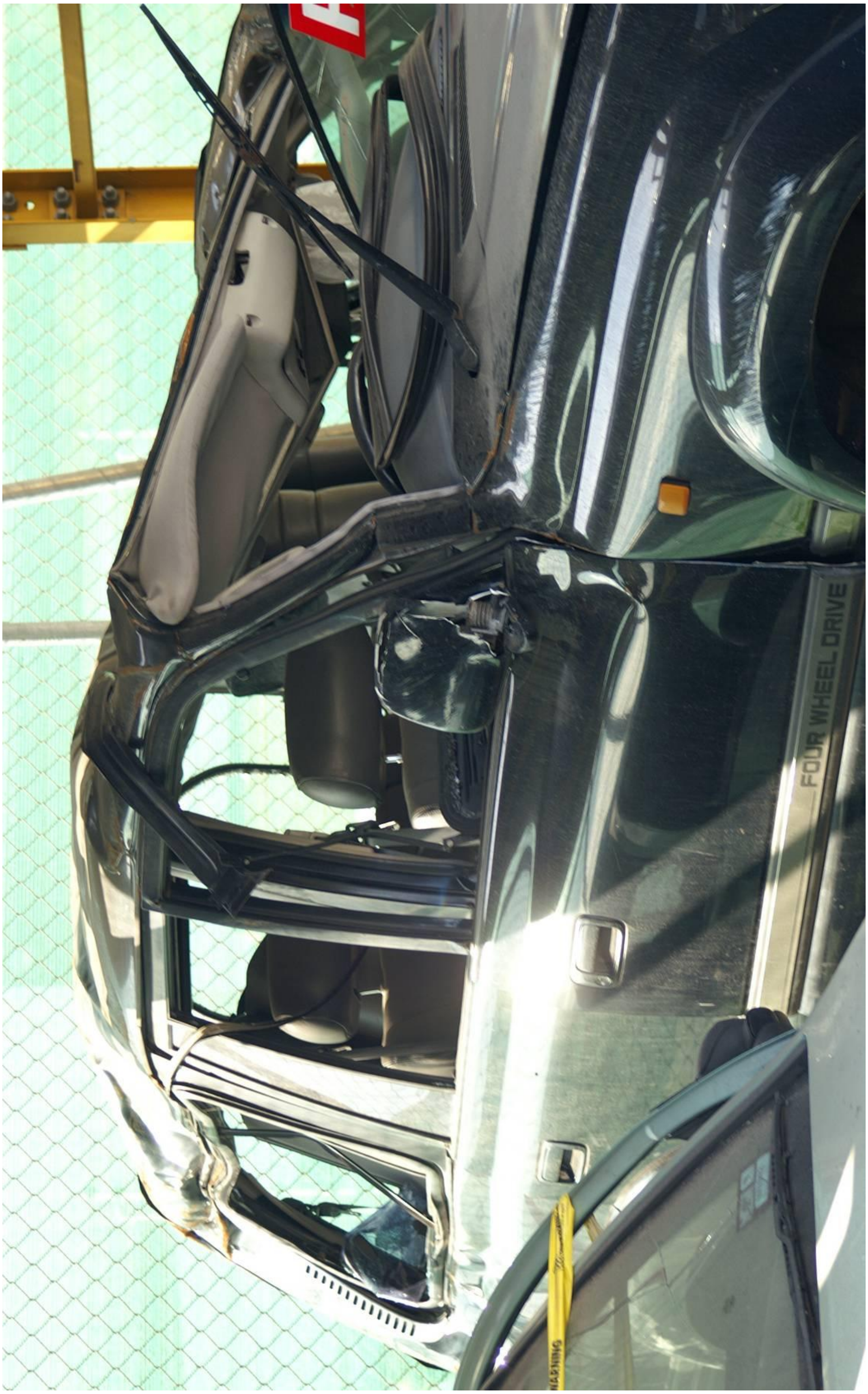

Figure 3: The right side of the vehicle in Figure 2. Note 1: the evidence of structural loading and deformation to the roof header between the C and D pillars. Note 2: The buckling failure of the A pillar adjacent to the top of the wing mirror. Note 3: The structural deformation of the driver's door roof headed and the windscreen header.

Figure 4: The left side of the vehicle in Figure 2. Note 1: The evidence of structural loading and deformation to the roof header between the A and D pillars. Note 2: The buckling failure of the A pillar adjacent to the top of the wing mirror. Note 3: The structural deformation of the A, B, C and D pillars.

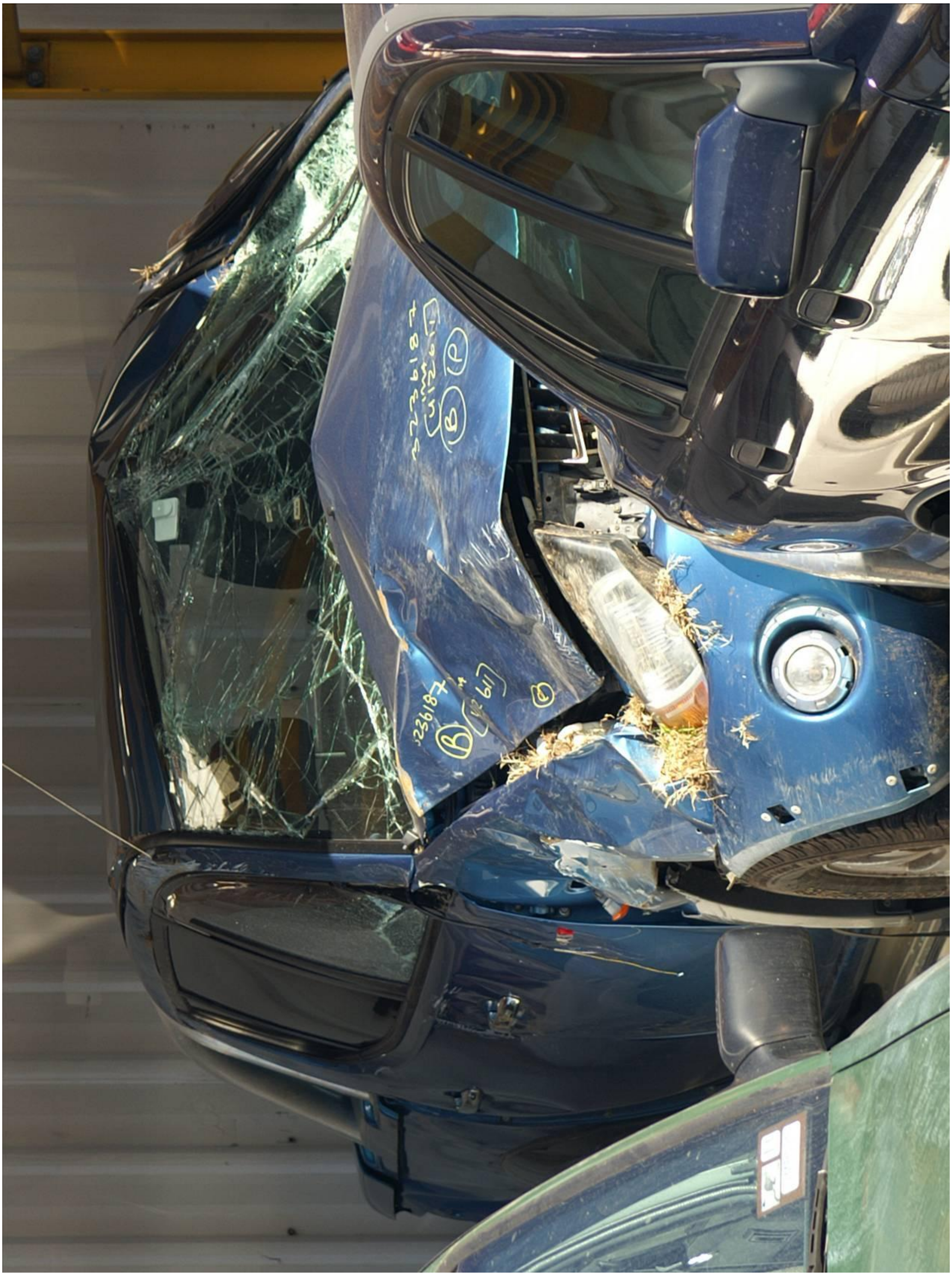

Figure 5: Illustration of damage to a vehicle roof such that the roof windscreen and door headers are structurally deformed as well as the A, B, and C pillars.

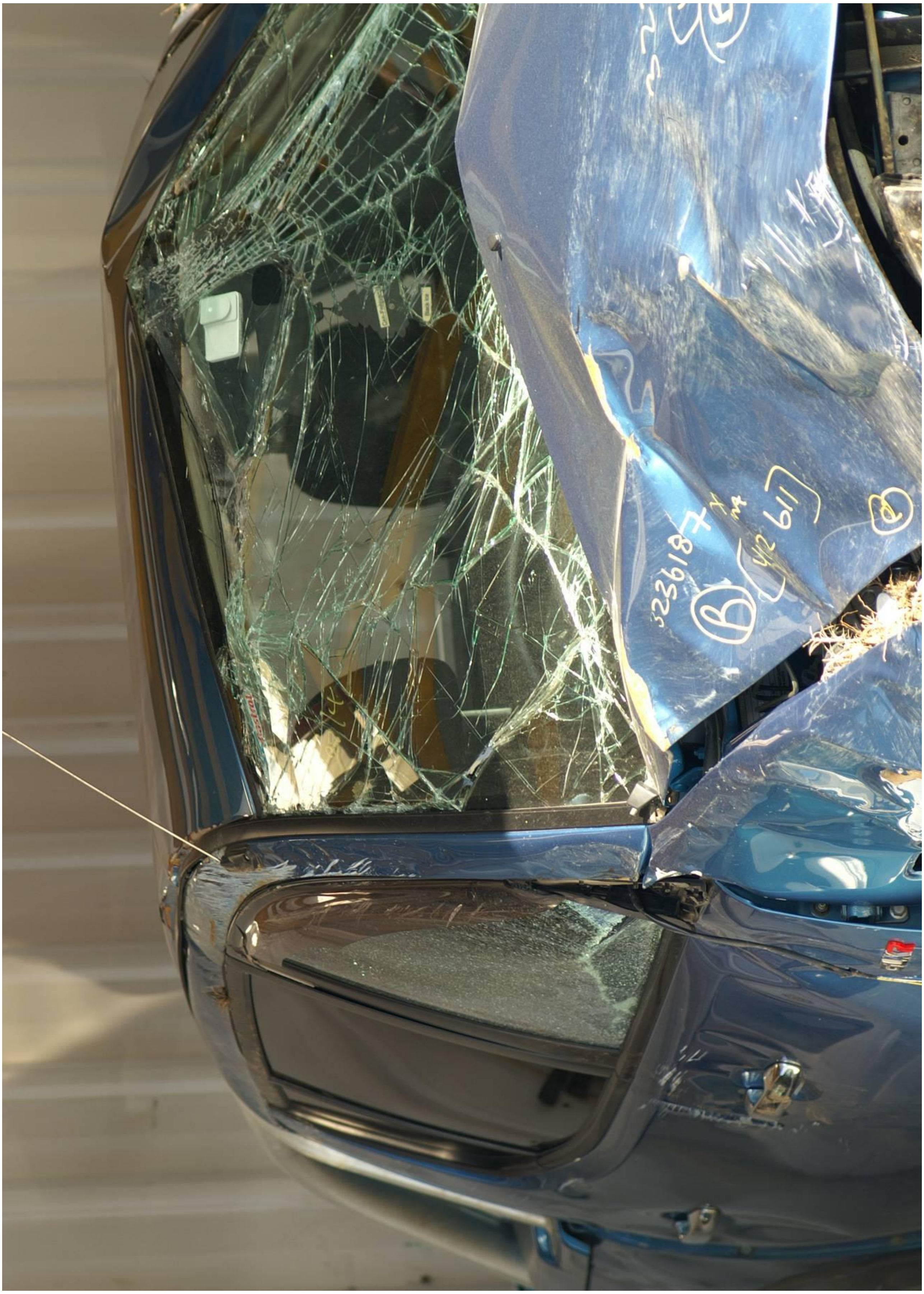

Figure 6: The right side of the vehicle in Figure 5. Note 1: The evidence of structural loading and deformation to the roof header between the A and B pillars. Note 2: The deformation and structural loading of the A pillar. Note 3: The structural deformation of the windscreen header.

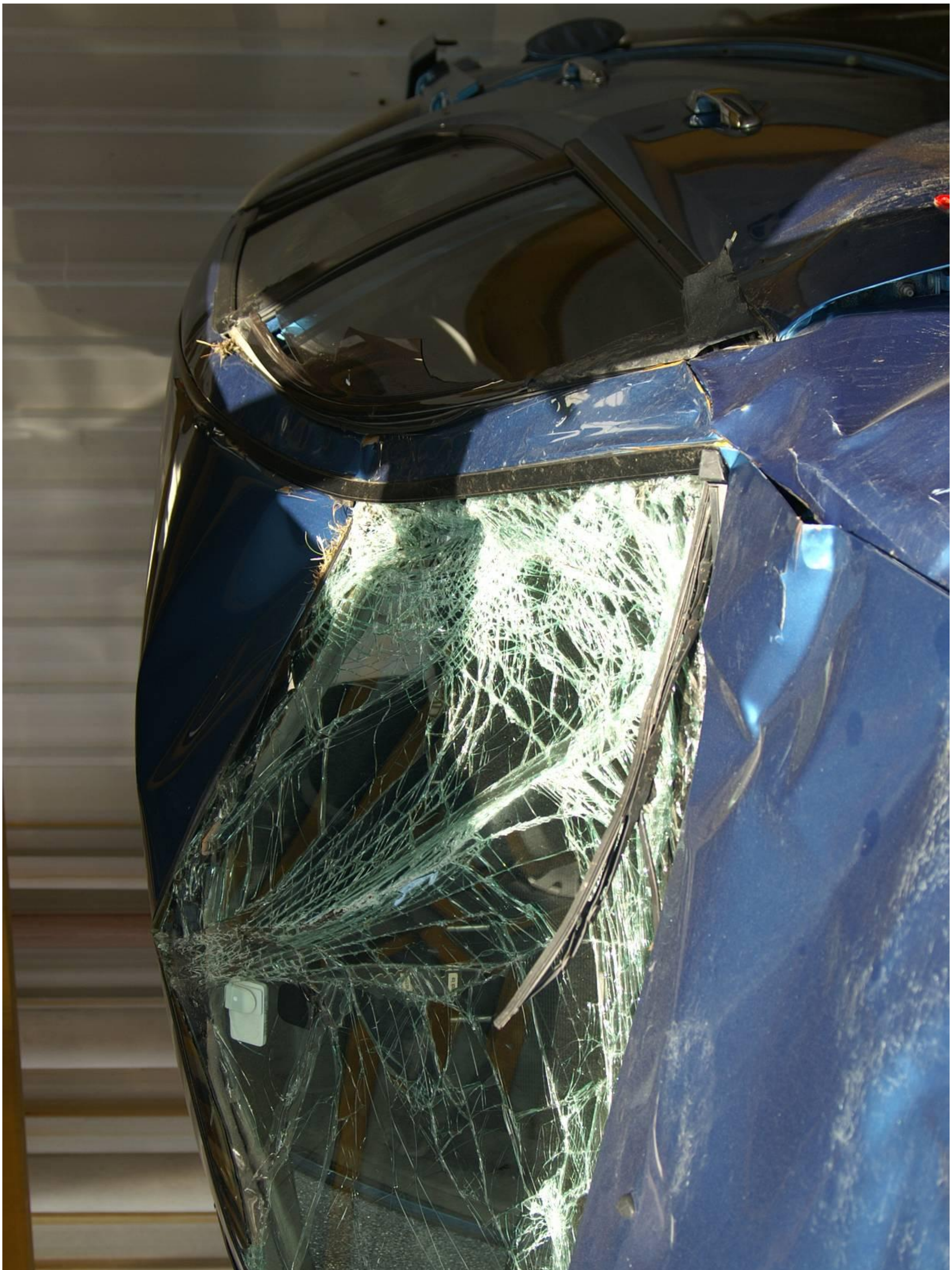

Figure 7: The left side of the vehicle in Figure 5. Note 1: The evidence of structural loading and deformation to the roof header between the A and B pillars. Note 2: The structural loading of the A pillar. Note 3: The structural deformation of the windscreen header.

Figure 8: Illustration of structural roof members cut. Also note the structural deformation to the front left structural rail.

Figure 9: The cut passenger side door roof header of the vehicle in Figure 8**.**

Figure 10: The cut driver's side door roof header of the vehicle in Figure 8.

Figure 11: Structural loading damage to the floor pan.

Figure 12: Structural loading damage to the floor pan.

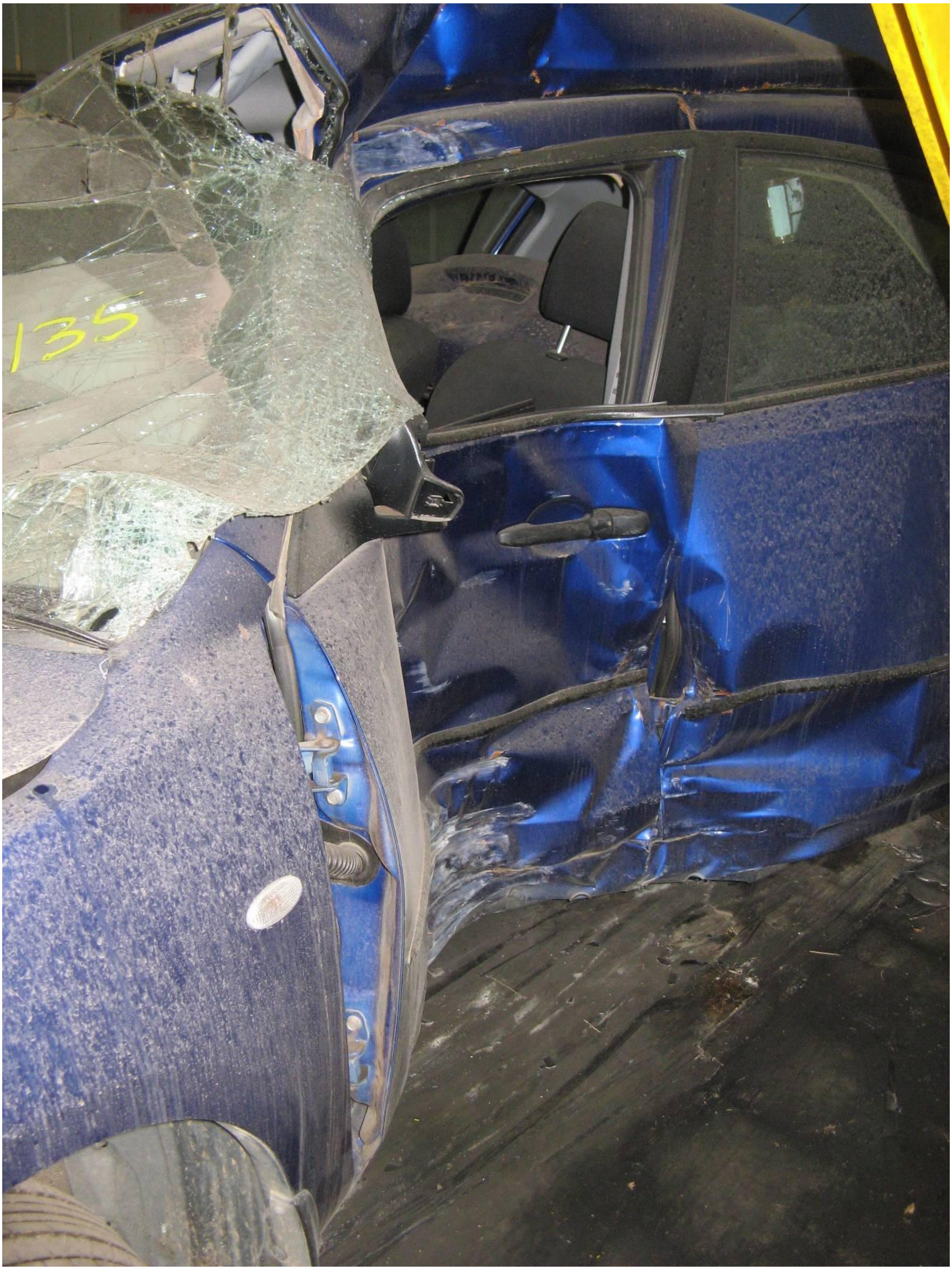

Figure 13: Structural loading damage to the floor pan.

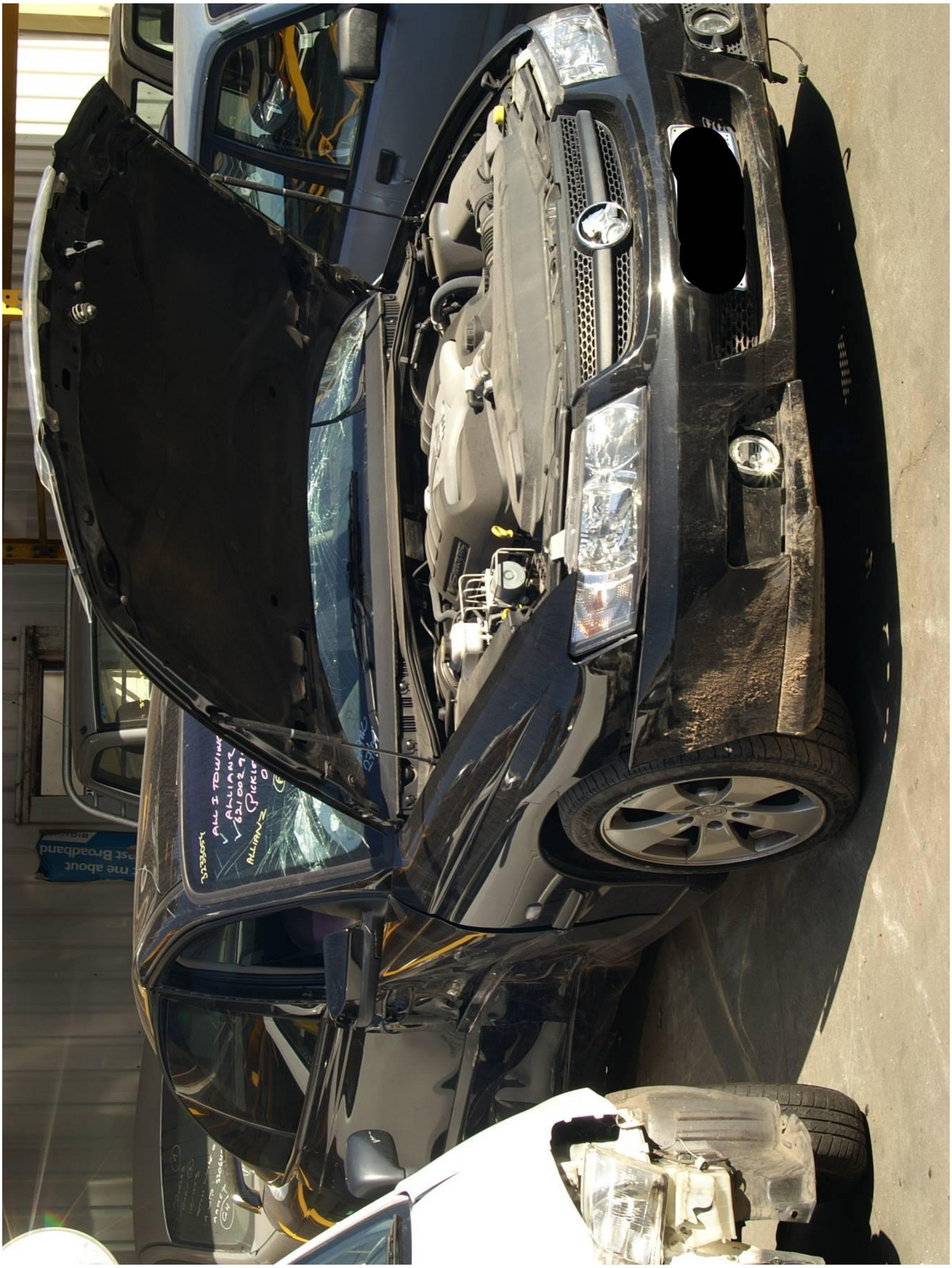

Figure 14: Structural loading damage to the floor pan.

Figure 15: Structural loading damage to the fire wall.

Figure 16: Structural loading damage to the fire wall.

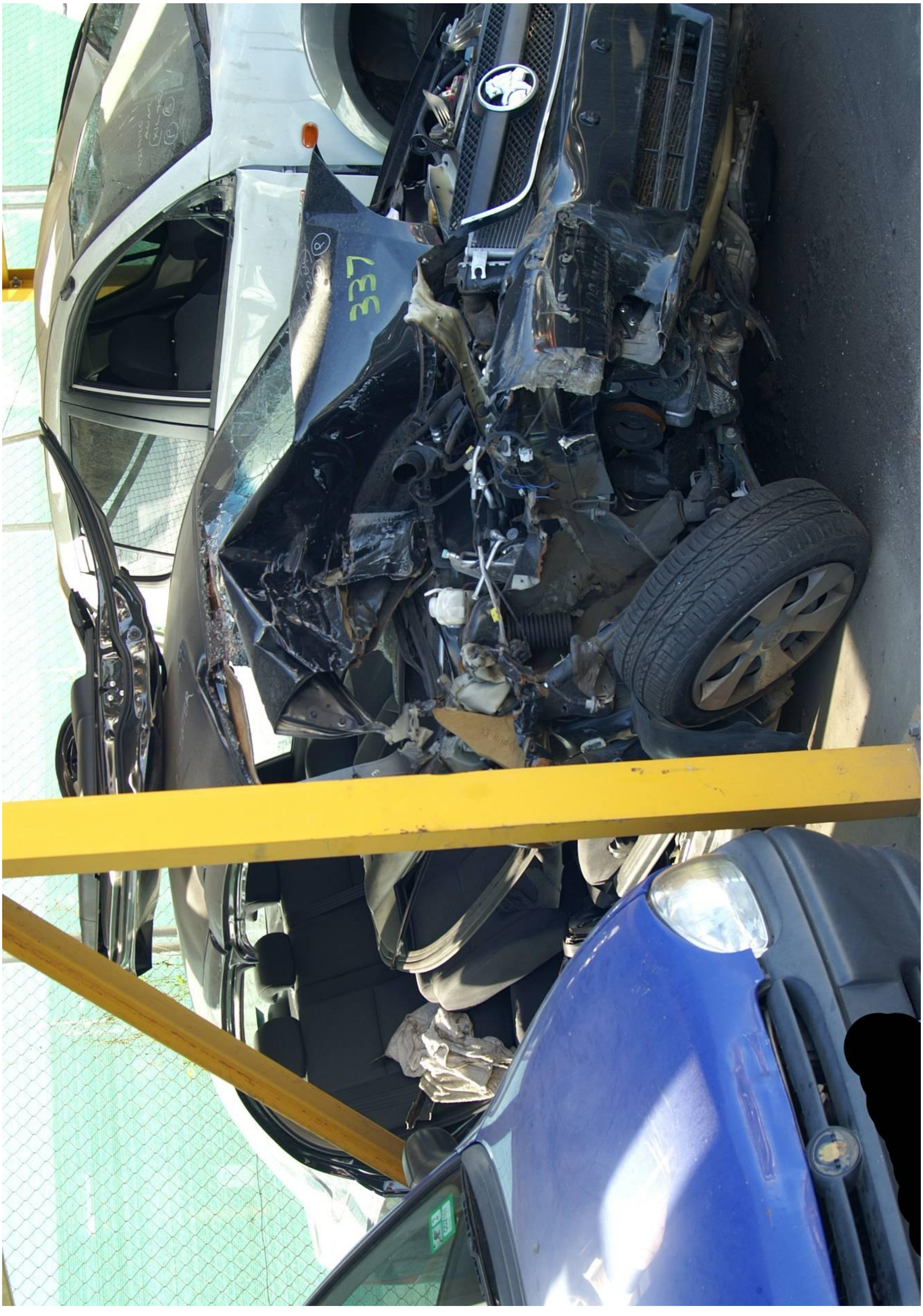

Figure 17: Structural loading damage to the fire wall.

Figure 18: Structural loading of a longitudinal structural rail, such that the right side rail is structurally deformed.

Figure 19: Structural loading of a longitudinal structural rail.

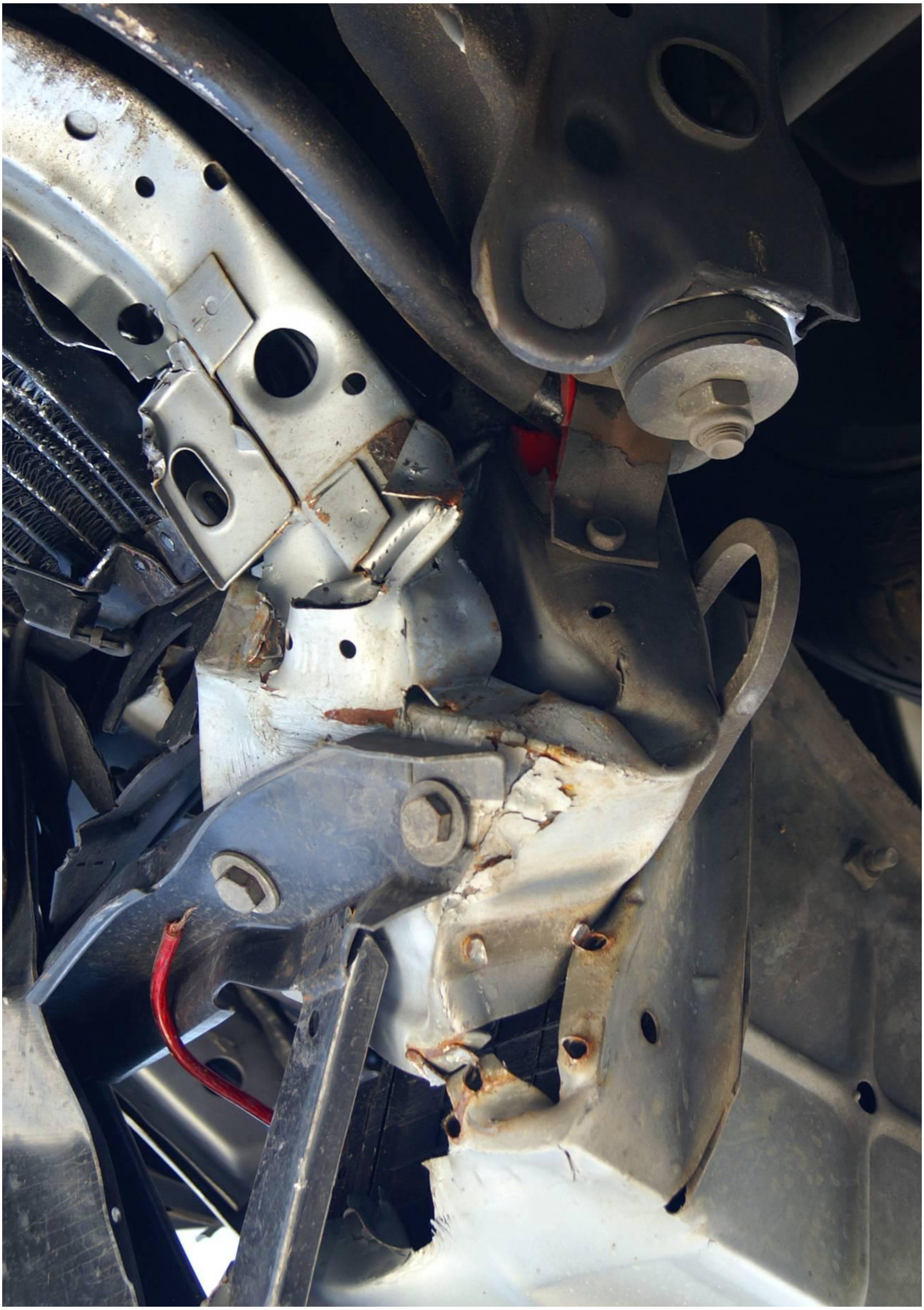

Figure 20: Structural loading of the longitudinal structural rail, such that the rail has folded back on itself.

Figure 21: Structural loading of a longitudinal structural rail, such that it has folded back onto itself.

Figure 22: Structural loading of a longitudinal structural rail.

Figure 23: Structural loading of a longitudinal structural rail.

Figure 24: Suspension damage.

Figure 25: Suspension damage.

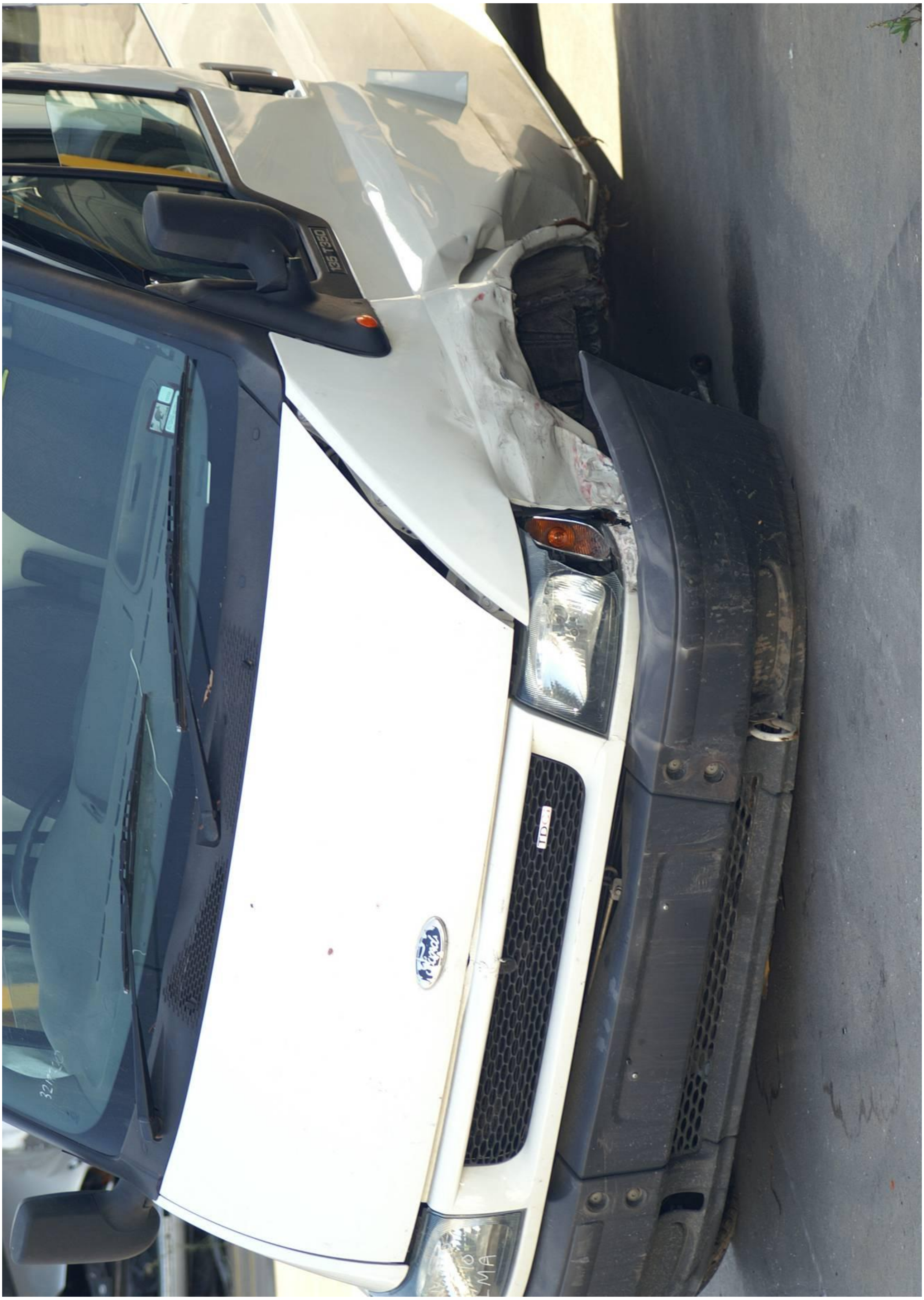

Figure 26: Suspension damage.

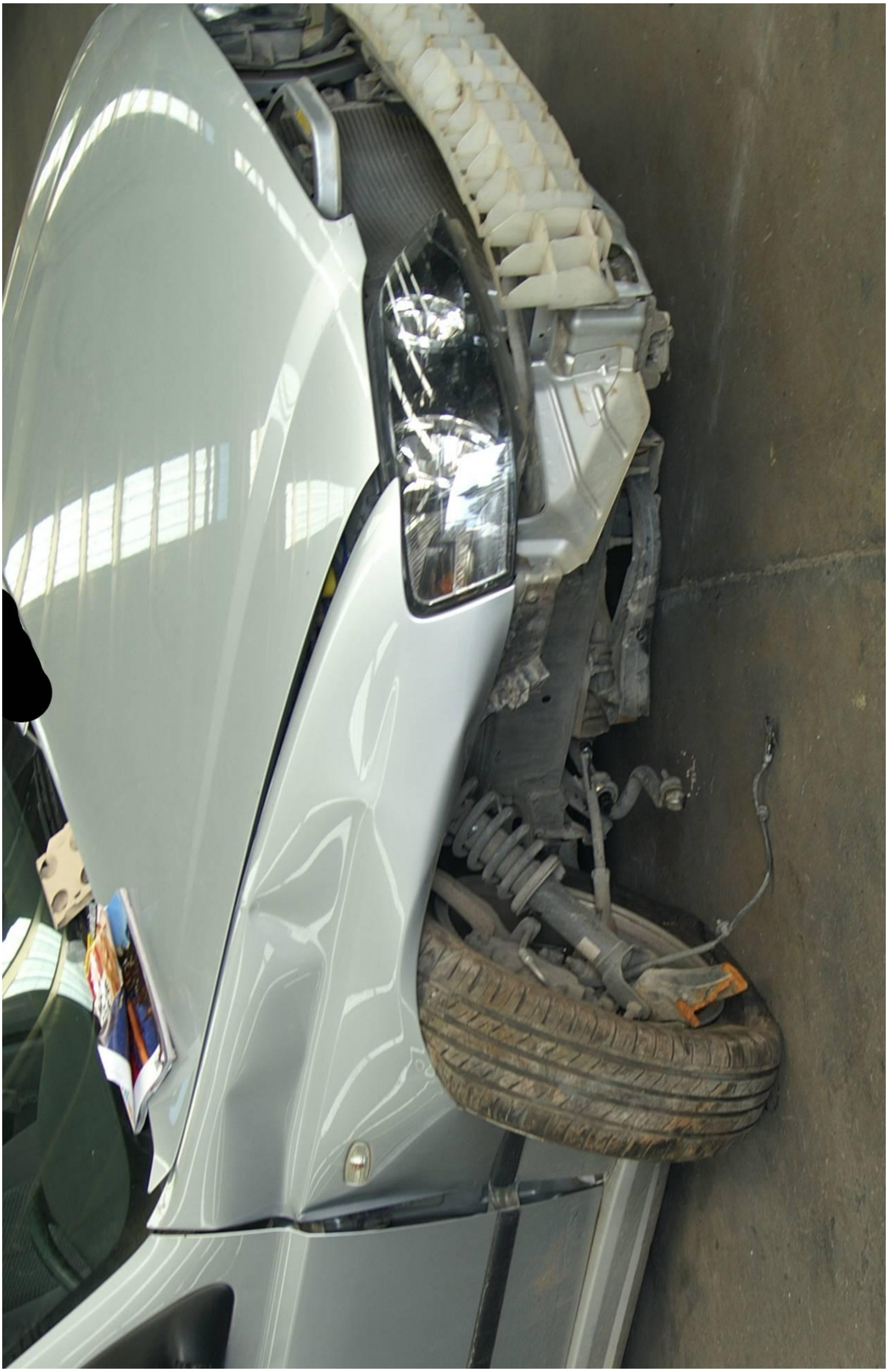

Figure 27: Suspension damage.

Figure 28: Suspension damage.