

Vehicle standards information



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Guidelines for light vehicle modifications

Introduction

This information sheet is for the assistance of persons who intend to register a modified light vehicle such as a car, motorcycle, panel van, utility, 4WD or light truck up to 4.5 tonne gross vehicle mass. This information is not intended to cover all of the technical aspects of modifications.

What are the owner's responsibilities?

The responsibility for ensuring that a vehicle is roadworthy rests with its owner. It is the owners responsibility to ensure that:

- The vehicle in its modified form continues to comply with the Road Transport (Vehicle Registration) Regulation 2007 and Australian Design Rules; and
- That the modifications do not reduce the strength, controllability or level of safety of the vehicle.

Owners should also check with their insurance companies before making any alterations to their vehicle as some modifications can affect the insurance cover.

Certification of vehicle modifications

Many vehicle safety and environmental control requirements are specified by Australian Design Rules (ADRs). The ADRs cover requirements that are sometimes too complex to be checked by inspection alone and often require engineering analysis to establish compliance.

A modified vehicle must continue to comply with all applicable ADRs.

Any person considering substantial modifications to their vehicle is advised to engage the services of an engineering signatory who is experienced in vehicle design, standards and construction requirements, and is recognised by the RTA for the purpose of issuing engineering certificates (see Vehicle standards information (VSI) No 15 *Engineering signatories* for a list of RTA recognised engineering signatories).

Owners are advised that as part of the process of certification, an engineering signatory will need to inspect and in some cases, require tests to be carried out on components that in the finished vehicle will be inaccessible or not fully visible. Owners should therefore contact an engineering signatory at the earliest possible stage (preferably before commencing the modification) and where required, arrange for the signatory to inspect the vehicle at appropriate stages throughout the modification process.

For vehicle owners & operators in New South Wales

Do I need an engineering signatory for minor modifications?

Vehicle modifications fall into three distinct categories:

- 'Owner certified' minor modifications which can be accepted for registration purposes without formal certification.
- 'Engineering signatory certified' modified production vehicles.
- 'Engineering signatory certified' individually constructed vehicles.

Owner certified minor modifications are generally those modifications which were optional equipment for the vehicle concerned. Owner certified modifications also include some non-standard modifications of a minor nature which do not affect the level of safety, strength or reliability of vital systems such as brakes and steering. These modifications have little or no impact upon the vehicle's level of compliance with the Australian Design Rules.

Examples of minor (owner certified) modifications are:

- Engine changes where the capacity increase is less than 15% above the maximum size engine available for the vehicle (providing no major structural modifications are necessary and where noise and/or exhaust emission ADRs apply, all standard equipment such as carburettors, exhaust systems, exhaust gas recirculating valves, oxygen sensors and catalytic convertors relating to noise and emission control are retained and operate correctly).
- The fitting of a proprietary sunroof (if the modifications are of a minor nature only).
- Fitting a 'package' available as optional equipment for the vehicle (eg front disc brakes, power steering, alternative transmission and bucket or bench seats).
- Additional lighting eg fog & driving lights.
- Alternative wheels and tyres within the owner certified limits set by the Authority (see Vehicle Standards Information Sheet No. 9 *Guidelines for alternative wheels & tyres*).
- Fitting of handling enhancing suspension components such as roll stabiliser bars and up-rated shock absorbers.

Major modifications which fall outside the category of minor (owner certified) modifications require submission of certification by an RTA recognised engineering signatory. This is usually in the form of an *Engineering certificate* prepared by the signatory.

Does the RTA require notification of the modifications?

All major modifications must be reported to the RTA. Minor modifications made to the motor vehicle or its equipment which affect registration details must be reported to the RTA to ensure that accurate records are maintained. These details include engine number, engine capacity/motive power/number of cylinders, body shape, fittings, number of seating positions, unladen (tare) weight, gross vehicle mass, axle code, wheelbase & overall axle space. If the unladen weight has changed, the owner must provide a weighbridge ticket for the vehicle in its new configuration.

Modifications are reported to the RTA by obtaining an *Adjustment of Records* and a 'blue slip' from an Authorised Unregistered Vehicle Inspection Station (AUVIS). For details of your nearest AUVIS contact the RTA's Customer Service Centre on 13 22 13.

The *Adjustment of Records*, blue slip and any engineering certificate are then presented at a Motor Registry. **The owners copy of the engineering certificate is stamped and endorsed by the RTA and must be kept in the vehicle. This certificate must be presented to an authorised officer of the RTA or the police when requested.**

To what extent can I modify my vehicle?

Engine modification

1. Original engine modified

Modifications to the original engine are permitted provided the following conditions are met:

- Normal engine reconditioning within manufacturer's limits is permitted;
- Modifications must not affect compliance with any emission or noise related ADRs;
- All emission control equipment must be retained and functional;
- If the modifications result in a substantial increase in power, then the adequacy of other components to carry the increased power (brake performance, vehicle controllability, suspension systems, etc) as well as the vehicle's continued compliance with the applicable ADRs must be addressed.

2. Replacement engine

There are set engine capacity limits for a modified passenger car or passenger car derivative and these are set out in the table below. Owners should note that an engine might not be suitable even though its capacity falls within the specified limits. Owners are therefore advised to check details of a proposed engine conversion with an engineering signatory before commencing the work.

Signatory certified modified production category		Maximum engine capacity	
		Normally aspirated	Supercharged or turbocharged
All vehicles originally having an engine with up to 4 cylinders or a rotary engine as the largest optional engine and with a tare mass up to 1100kg		In cubic inches: Original tare mass (kg) × 0.183 In millilitres (cc): Original tare mass (kg) × 3.0	In cubic inches: Original tare mass (kg) × 0.153 In millilitres (cc): Original tare mass (kg) × 2.5
Other vehicles with a tare mass over 1100kg, and/or with engines having more than 4 cylinders.	Mono constructed	In cubic inches: Original tare mass (kg) × 0.294 In millilitres (cc): Original tare mass (kg) × 4.82	In cubic inches: Original tare mass (kg) × 0.244 In millilitres (cc): Original tare mass (kg) × 4.0
	Vehicles with a separate chassis construction (as original equipment)	In cubic inches: Original tare mass (kg) × 0.333 In millilitres (cc): Original tare mass (kg) × 5.46	In cubic inches: Original tare mass (kg) × 0.286 In millilitres (cc): Original tare mass (kg) × 4.68

Note:

- The engine capacity to be used for rotary engines is the displacement of all rotors × 2.
- 'Original weight' is the original (unmodified) 'tare weight' of the sedan version of the vehicle model fitted with the largest engine available for the model but without optional accessories such as air conditioning and tow bar.
- The above limits do not apply to 4WD's, light trucks and buses up to 4.5 tonne gross vehicle mass.
- Vehicles with engines of greater capacity than that provided in the table will not be acceptable for registration as a modified production vehicle.

Emission standards for replacement engines

1972 and later model vehicles with substitute engines must meet the intent of the later of the Australian Design Rules applicable to either:

- a) The original vehicle; or
- b) The substitute engine.

To ensure continued compliance with emission standards, any replacement engine should come from a vehicle which is subject to the same or more stringent emission control requirements. An alternative is for an earlier engine to be upgraded during reconditioning to more recent engine specifications. All anti-pollution devices should be fitted and functional.

Vehicles manufactured prior to noise and/or exhaust emissions related ADRs must meet certain minimum noise and emission requirements if the engine modification is to such an extent as to require certification by an engineering signatory. Engineering signatories will be able to give you more information about these requirements.

Upgraded safety equipment

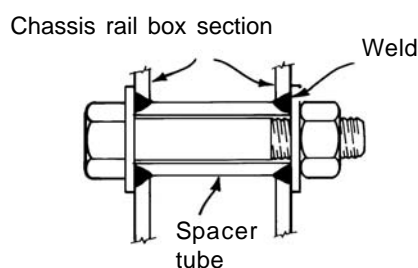
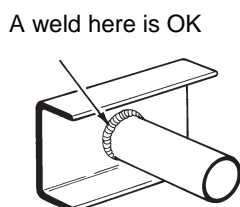
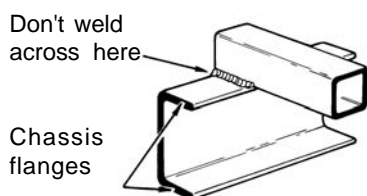
In the case of an engine modification or substitution which falls within the engineering signatory certified (modified production vehicle) category, the following vehicle safety systems must be upgraded in order to provide for the increase in vehicle performance. These are the minimum standards required but where any ADR applies, the ADR takes precedence.

- Seat belts must be installed for all seating positions. Lap/sash seat belts are required for all front and rear outboard seating positions. Lap/sash or lap belts shall be fitted to inboard seating positions (this requirement does not apply to small buses -no upgrading of seat belts is required for these vehicles).

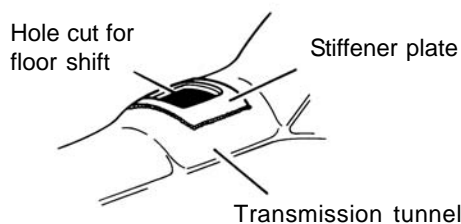
- Windscreen washers must be fitted.
- Two speed windscreen wipers with a fast speed of at least 45 cycles per minute and a slow speed of at least 20 cycles per minute must be fitted. (Single speed wipers are acceptable if the speed is 45 cycles per minute or more).
- A windscreen demister must be fitted.
- There must be an external mirror on the drivers side (and on the passengers side if there is not an effective internal rear view mirror).
- If the replacement engine has a capacity more than 45% above that of the largest optional engine for the vehicle and the vehicle is "pre ADR 10/--", a collapsible steering column is to be fitted.
- Flashing turn indicator lights to be fitted at the front and rear of the vehicle if not originally provided on the vehicle.
- Automotive safety glass (either marked accordingly or can be shown to be safety glass) shall be fitted for the windscreen and other windows in the vehicle.

Chassis or body subframe structures

- Avoid welding or bolting to the flange areas of chassis and subframe rails but in anycase, *do not weld* across the flanges of chassis rails.
- Fit spacer tubes when bolting through hollow sections to prevent crushing of the section.



- Holes cut in structural areas of the chassis or body should be reinforced to make up for the reduction in strength which results.



- Any bolt, nut, stud or other fastener subject to vibration should be locked against slackening eg use spring washers or nyloc nuts.
- Any hole cut in the body or floor panel must be sealed against entry of exhaust fumes and it must not be possible for the driver or passenger to contact moving parts.

Suspension

Besides assuring a comfortable ride, a vehicle's suspension system controls wheel movement for handling and road holding. Manufacturers conduct extensive test programs to develop suitable suspension settings. Adjustments, such as lowering the vehicle, can upset the suspension characteristics and cause unpredictable handling. Generally, roll stabilizer bars, axle locating rods, upgraded shock absorbers or upgraded springs may be used provided they are suitable for the vehicle and are properly fitted. However, the following suspension modifications are not acceptable:

- Welding forged components such as stub axles or control arms.
- Fitting longer, non-standard shackles to leaf springs.
- Fitting any additional components or altering the suspension so that the wheels or tyres may contact any component under the full range of suspension and steering travel.
- Fitting any additional components or altering the suspension ride height so that any part of the vehicle other than a wheel or tyre can contact the road in the event of a tyre deflation.

If major changes to the suspension (such as substitution of a non standard front cross member) are carried out, they should be done under the strict guidance of an engineering signatory.

Wheels and tyres

Refer to VSI No.9 *Guidelines for alternative wheels and tyres*.

Steering

As with suspension systems, a vehicle's steering system is vital for safety and vehicle manufacturers make considerable efforts to develop suitable steering geometry. Where any non standard part is used, owners are advised to seek the assistance of an engineering signatory to assess the structural integrity of the steering system and the adequacy of the steering geometry under all conditions of steering and suspension movement.

Steering components are fundamental to vehicle safety. Always avoid cutting, welding (or otherwise hot working) any forged steering components such as pitman arms, drag links or steering knuckles.

Where ADRs 10A, 10B, 10/00 or 10/01 apply, the vehicle's steering column and steering wheel are designed to minimise injury to the driver during a crash. In the case of replacement steering wheels (including aftermarket steering wheels fitted with airbags), owners should seek assurance from the supplier or an engineering signatory that the vehicle continues to comply with these requirements.

The diameter of the steering wheel affects the driver's control of the vehicle. A reduction in the steering wheel diameter will result in increased steering effort and 'kick back' from road bumps.

Vehicle Standards Bulletin No. 4 issued by the Department of Transport & Regional Services (DOTARS) covers conversion requirements for left hand to right hand drive. This publication is available from DOTARS, PO Box 594, Canberra ACT 2601, T (02) 6274 7111.

Brakes

Brake systems must not be modified such that the brake performance is reduced or that the risk of failure of the brake system is increased. Brake discs or drums must not be machined beyond the reconditioning limits set down by the manufacturer. When brakes are upgraded using components or systems which were not standard options for the vehicle, an engineering certificate is necessary to attest to the adequacy of the new system, eg: hydraulic fluid sufficiency, balanced braking on all wheels, brake pedal pressure limitations and braking performance.

Bodywork and interior

There are general requirements concerning alterations to the bodywork:

- No alteration may cause a hazard to persons due to exposed sharp edges or projections; and
- No alteration may cause a reduction in the level of safety or overall strength of the vehicle.

Roof conversions

When installing a sunroof, ensure that structural members in the roof are not weakened. Ribs or braces which are cut should be joined to the sunroof frame. Also, avoid any projections which might come into contact with the vehicle's occupants.

In the case of major roof alterations, owners are advised to seek the assistance of an engineering signatory.

Seats

Owners should ensure that the seat and its anchorages comply with any applicable ADR requirements (possibly by certification from the seat manufacturer or by an engineering signatory) and the appropriate seat belts are fitted to all seating positions.

Vehicle Standards Bulletin No. 5 issued by DOTARS covers requirements for the manufacture of additional seats.

Seat belts

The level of safety provided by seat belts must not be reduced. Seat belts must not be replaced by belts of a lesser standard or with second-hand belts. For example, lap only belts must not be used in place of retracting lap/sash seat belts. The use of a retractable seat belt disabling device is not acceptable.

Seat belt anchorage points have been carefully chosen and tested by the vehicle manufacturer. Do not alter the location or strength of seat belt anchorage points without advice from an engineering signatory.

Dash panel

Where ADR 21 or 21/00 applies, the vehicle's dash panel is required to be padded to lessen the chance of injury to passengers in a crash. Instruments, such as tachometers, radios or switches must not be fitted to the padded portion of the dash panel in vehicles subject to ADR21 or ADR 21/00. Cutting away of the padding material is not acceptable.

Front structure

Where ADR 10B, 10/00 or 10/01 applies, the front of the vehicle is sometimes designed to crush on impact to absorb crash forces. Any structural modifications in this area should only be made on the advice of an engineering signatory experienced in body and chassis structures.

Crash impact occupant protection

Where ADR 69/00 or 72/00 applies the vehicle has been built and specially equipped to minimise the likelihood of injury to the occupants in a full frontal or side impact. These vehicles are in general fitted with airbags by their manufacturers.

Any modification that would affect these crashworthiness safety standards should only be made on the advice of the vehicle's original manufacturer or an engineering signatory.

What if I want to build my own vehicle?

Vehicles built on specially constructed floorpan or chassis structures are referred to as Individually Constructed Vehicles ('ICVs'). Some extensively modified production vehicles are also classified as individually constructed vehicles. These vehicles must comply with current design and safety standards as well as meeting recognised standards for strength and controllability.

A vehicle will be classified as an individually constructed vehicle if it is:

- A vehicle with a specially constructed chassis (non production vehicle) or a manufactured replica chassis.
- A vehicle where the chassis has been widened or narrowed (either in places or along the whole length of the chassis).
- A vehicle with a production chassis which does not retain at least one of the original structural crossmembers in the same place for that chassis.
- A vehicle where the arrangement of the engine and driveline is substantially changed eg: engine moved from front to rear or to a 'mid mounted' position. Also, where the vehicle is changed from front wheel to rear wheel drive.
- A vehicle with monocoque construction, where the subframe structure has undergone significant structural change such as removal and replacement of subframes with structures of a different design or modifications to inner mudguard panels, if this involves relocation or modification of the subframe rails.

Persons contemplating building an individually constructed vehicle are advised to seek the assistance of an RTA recognised engineering signatory prior to commencing, and during the course of, the project.



For further enquiries:



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