

MODIFIED VEHICLE GUIDELINES 2006

TECHNICAL GUIDELINES FOR
AIR AND NOISE EMISSION REQUIREMENTS
FOR MODIFIED IN-SERVICE VEHICLES

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INTRODUCTION

Motor vehicles have a major impact on air quality and noise. Vehicle manufacturers are required to produce new vehicles that have low air and noise emissions levels.

While recognizing that, as a vehicle ages, the level of emissions will rise, our aim is to ensure that in-service motor vehicle emissions are kept as low as possible through proper and regular maintenance.

EPA Victoria's objective is to work with all Victorians to enable the achievement of a clean, safe and sustainable environment.

Many owners customise their vehicles.

Modifications can range from simply changing wheels, through to modifying engines or even building individual vehicles.

Guidelines on what modifications are acceptable have been developed to permit modifications to be carried out legally yet prevent the benefits of vehicle air and noise emission standards being eroded.

It is neither reasonable nor practical to prohibit vehicle modifications altogether.

Owners have a choice in the extent of the modification, the nature of the modification and what components are used. When modifications are planned, owners must ensure that emissions will not be increased and that the vehicle will comply with the vehicle-related provisions of the *Environment Protection Act 1970* and with the *Environment Protection (Vehicle Emissions) Regulations 2003*.

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The modifications permitted below have been assessed by EPA – through tests, measurements or engineering reason – not to increase emissions beyond what could be expected of a normal unmodified vehicle of a similar age.

The vehicles that are the subject of this guideline are primarily those constructed with emission controls – in other words, vehicles manufactured after 1 July 1976 – although some general requirements (for example, noise) will apply to all vehicles.

The *Environment Protection Act 1970* (the Act) requires various parties – including designers, manufacturers, sellers, owners and drivers – to do or not do certain things with respect to air and noise emissions from motor vehicles. These requirements are spelt out in more detail in the *Environment Protection (Vehicle Emissions) Regulations 2003* (the Regulations). Both the Act and the Regulations state that anyone who fails to comply with a requirement is guilty of an offence and liable to a

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penalty, with the maximum penalty for the most serious offences being 240 penalty units (over \$240,000).

However, this publication is NOT a comprehensive guide to the motor vehicle requirements in the Act and the Regulations. It is a practical guide to what modifications are permitted under the Act and the Regulations.

This publication does NOT deal with the roadworthy or road safety requirements under the *Road Safety Act 1986* or its associated regulations. A roadworthy inspection is a check of the vehicle to ensure that all safety-related components have not worn or deteriorated to the extent that the vehicle is unsafe for normal road use. A roadworthy inspection only covers safety-related items and is not a check of the overall mechanical reliability or general condition of the vehicle. It should not be relied upon to indicate compliance with the Regulations.

In this document:

Act means the *Environment Protection Act 1970*

Regulations means the *Environment Protection (Vehicle Emissions) Regulations 2003*

ADR means the Australian Design Rules.

GENERAL REQUIREMENTS

Persons responsible for vehicles must ensure that all requirements of the Act and the Regulations are complied with. The 'emission control' technical requirements are set out in regulations 7–11, 13–15,

17 and 24. Those regulations cover the following aspects:

- (a) visible exhaust emissions (regulation 7)
- (b) carbon monoxide emission from spark ignition engine propelled vehicles (r. 8)
- (c) exhaust emissions diesel engine vehicles (r. 9)
- (d) noise emission standards (r. 10)
- (e) exhaust system construction (r. 13)
- (f) idle mixture control construction (r. 14)
- (g) maintenance of emission control equipment (r. 15)
- (h) labelling of motorcycles for noise (r. 17)
- (i) maintenance of unleaded requirements (r. 24).

In addition, regulations 18–23 contain offence provisions, setting out the penalties for failure to comply with various technical requirements. The Act also contains offence provisions.

These Guidelines have been written with the general aim of assisting owners of vehicles that are in use to comply with the technical requirement regulations, and the specific aim of assisting those owners to identify what – if any – modifications to their vehicles can be made without falling foul of the offence provisions in the Act and the Regulations.

Persons other than owners and users have obligations too. For example, a person who installs, removes, replaces or repairs noise-reducing equipment on a motor vehicle must ensure that the vehicle meets the requirement of regulation 10 when

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the installation, removal, replacement or repair is complete.

The basic rule is that the use of non-original equipment, aftermarket parts or systems as an add-on, auxiliary, or secondary part of a system is permitted if their use does not adversely affect emissions performance. The fitter and owner should ensure that they have evidence that supports this.

Any modification is permitted provided that it can be shown, by way of test¹ or engineering reason, to show that the modification would not be expected to cause an increase in emissions beyond a similar, unmodified vehicle.

All motor vehicles must also be safe; and any repairs, work or modifications must be performed in a professional manner.

DOCUMENTATION

In all cases the registered owner must be able to provide, when required, documentary evidence to show that the vehicle complies with any EPA requirement as a result of the modification.

The date of manufacture is the date described on the 'built date' plate on the chassis or described on the compliance plate. In the case where these plates do not exist, the date of manufacture may be one of the following:

- the date assigned by Vicroads
- the date specified by the certifying engineer in his or her report.

¹ Test procedures used for demonstrating compliance must be to the ADR applicable to the vehicle model. A simple exhaust emission test at idle, steady speeds or using an IM240 procedure is not acceptable.

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All parts, features and systems of the vehicle that are not modified must continue to comply with all EPA regulations applying to the vehicle at its original date of manufacture.

Modified parts, components or systems must enable the vehicle to comply with requirements that were applicable at the date of manufacture of the original vehicle.

The term 'engine' includes all engine-related components, whether or not attached to the engine, that can affect the emissions from the vehicle – for example, catalytic converters, oxygen sensors, thermal afterburners and engine management systems.

The following list of modifications is not exhaustive, nor does it cover every possible modification that can affect emissions. Many of the changes described below will also require certification or approval by an appropriately approved engineer.

1. Intake systems

Intake systems are designed to ensure that the correct air/fuel ratio is available to the engine for the cleanest burn to minimise exhaust emissions. Systems that provide excess air or fuel can create high exhaust emissions from the vehicle. Fuel or other hydrocarbon vapour that escapes as evaporative emissions can lead to the formation of photochemical smog.

Replacement air cleaners are permitted provided that they have all connections and systems present on the original air cleaner and operate in an identical manner.

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- (a) Open element or *pod type air cleaners* on carburetted vehicles are not permitted.
- (b) *Dry element pod type air cleaners* are permitted on EFI vehicles. Oiled, oil-soaked or fluid-treated elements are not permitted. Any sensors integral to the original system must be retrofitted to the same approximate location.
- (c) *Intercoolers* that are larger than standard or have a different mounting location or are added where none were originally fitted, are permitted only if no other changes to the intake system have been made. In other words, you may have a pod filter or modified/added intercooler, but not both. Any sensors integral to the original intercooler or intake system must be retrofitted and be in the correct location.

Note: aftermarket turbocharging kits that include intercoolers that have been type tested (ADR certified) for the model vehicle are permitted. Documentary proof must be retained to substantiate this.

- (d) *Airflow meters* must not be disconnected. They may be relocated, provided they are functionally equivalent and are in the same approximate location.
- (e) Modified or aftermarket *plenum chambers* or *throttle bodies* are not permitted.

2. Fuel systems

A fuel system that provides the incorrect amount of fuel to the engine or intake system will create high

levels of exhaust emissions and will probably cause an increase in fuel consumption.

Alternative, replacement or aftermarket *carburettors* are permitted if they are of equivalent specification to the original equipment, including, for example, flow rates, air/fuel metering, needle size etc. The carburettor must also provide for all external connections and systems present on the original carburettor.

Alternative, replacement or aftermarket *EFI systems* are not permitted unless ADR certified for that particular vehicle make and model.

Extra or larger fuel injectors are not permitted.

Variable fuel pressure regulators are not permitted unless fitted by the manufacturer as original equipment.

3. Engines

Vehicle engines are designed by the manufacturer of the vehicle to meet stringent exhaust and evaporative emission standards set out in the ADRs. Changing the engine of a vehicle must not result in more pollution being emitted than would be emitted by the original engine when properly maintained.

The following engine replacement options are available.

- (a) Replacement of an original engine with a new, reconditioned or used engine of the same general specification is permitted. This engine must be designed to meet the original engine's emission standards. All emission control devices and systems must be fitted. For example, you can install a new,

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reconditioned or secondhand Commodore VN 6-cylinder engine into your VN Commodore.

- (b) Replacement of an original engine by an engine that was offered as an option for that vehicle make and model at the time of manufacture of the vehicle is permitted. The replacement engine must be of the same specification and in its original configuration including all emissions-related devices or systems. For example, Ford provided several engine options for the XE Falcon, so the 3.3 litre 6-cylinder engine can be replaced by a larger V8 from the same model range.
- (c) Replacement of an original spark ignition engine by a diesel engine is permitted.
- (d) Replacement of an original engine with an engine that was designed to meet more stringent requirements is permitted provided that the replacement engine is in its original configuration including all emissions-related devices or systems. For example you can replace the engine of your 1987 VL Holden Commodore with an engine made in 1997 for a VS Commodore.
- (e) Replacement of an original engine by any other engine is permitted provided that:
 - i. if the original engine was originally fitted with emission control devices or systems, then the replacement engine must be of similar or later age and must be designed to meet the same or more stringent emission standards (plus the emission control devices or systems applicable to that replacement engine must be fitted and operate in the correct manner)

and

- ii. The mass of the vehicle must be no more than 114 kg greater than the mass of the vehicle from which the replacement engine originated.

An acceptable example would be the fitting of a V6 engine from a VS Commodore passenger car into a 1996 Toyota Hilux originally fitted with 4-cylinder engine. An unacceptable example would be the fitting of a VS Commodore V6 engine into a larger, heavier vehicle such as a 1996 Toyota Landcruiser.

- (f) Replacement of an original engine by any other engine may be acceptable if it can be shown by way of test or appropriate engineering reasoning that the emissions are equal to or less than could be expected from the original vehicle.

4. Turbochargers/superchargers

Turbocharging or supercharging an engine has the potential to increase the power of the engine. Designing a system that meets the ADR is a complex process. A poorly designed or fitted system will significantly increase exhaust emissions, increase fuel consumption and reduce engine life.

An emission-controlled engine may be turbocharged or supercharged only if:

- the conversion is unconditionally endorsed in writing by the vehicle manufacturer as being ADR compliant
- or
- the type conversion has ADR certification
- or

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- the converted vehicle is in all respects identical to the production turbocharged/supercharged vehicle.

Fitment must not interfere with the effective operation of any other emission control system or device, including the evaporative emission system.

Variable turbocharger boost valves ('boost controllers') or other means of altering boost levels are not permitted unless part of an original manufacturer's fitment.

'Blow off' ('pop off') valves must be plumbed back into the system. Atmospheric venting is not permitted.

External wastegates are not permitted.

The onus is on the fitter of the turbocharger/supercharger and the owner of the vehicle to meet the above conditions.

See also **1. Intake systems** above regarding intercoolers.

5. LPG conversion

Although publicised as a clean fuel, LPG (Liquefied petroleum gas) still produces exhaust pollution. Accordingly, LPG vehicles must have an appropriately designed and fitted system; otherwise they can produce high levels of pollution.

Conversion of a vehicle to operate on LPG must be performed to the appropriate Australian Standards, and VicRoads and Automotive Alternative Fuels Registration Board 'Code of Practice' requirements.

- (a) An engine can be converted to operate on LPG only (not dual fuel – see 5(b) below) as follows.

- For vehicles built prior to 1 February 1986 and originally operating on leaded petrol, there are no exhaust emission requirements other than a maximum CO concentration at idle of 4.5 %. (Note that **General requirements** – see page 3 above – must still be met.)
- For vehicles built after 1 February 1986, or originally operating on unleaded petrol, catalytic converters and associated emission and engine control systems of vehicles must remain operational. (See 5(c) below.)

Vehicles converted to operate on LPG only are not required to retain the evaporative emission control system (carbon canister). The fuel tank and/or fuel lines must be removed or otherwise permanently disabled.

- (b) An engine can be converted to operate on both petrol and LPG (dual-fuel) provided that, when the vehicle is operated on petrol, it complies with the petrol-related regulations. If any emission control systems, evaporative emission systems and devices or engine control and management systems (including catalytic converters and oxygen sensors) were originally fitted, they must remain operational.

Allowances are made for minor air cleaner and carburetion/injection modifications required to fit the conversion. A heated air intake system, if fitted, can be removed. The original air cleaner may be removed and replaced by a new unit if it is compatible with

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and recommended by the system manufacturer. These allowances recognise that dual-fuel vehicles operate for the majority of the time on gas.

- (c) All spark ignition engined passenger vehicles manufactured after 1 February 1986 must meet the exhaust emission limits regardless of whether the vehicle is operating on LPG or petrol. It is the responsibility of the fitter to ensure that the system fitted complies with this requirement. On vehicles fitted with a three-way catalytic converter, a closed-loop feedback system would be required to enable the catalytic converter and oxygen sensor to operate correctly. If the original engine management system is operationally unsuitable, an equivalent LPG system must be fitted that enables the vehicle to meet the equivalent emission standards.

Owners should ensure they have documentary evidence that the LPG conversion system fitted to the vehicle does not affect emissions performance. The manufacturer or distributor of such parts or systems should supply this evidence in writing, based on their own testing efforts and engineering judgement.

6. Positive crankcase ventilation (PCV)

PCV systems return oil and fuel vapours from the engine block to the engine intake system for combustion in a similar manner to the evaporative emissions control system. This reduces the levels of hydrocarbons emitted from the vehicle.

'Catch Cans' must be plumbed back into the vehicle's control system. Atmospheric venting is not permitted.

7. Engine management systems

An engine management system enables the engine to function with minimum emissions under a wide range of operating conditions. It also uses a variety of sensors to optimise combustion by altering how the engine operates, thus maximising fuel economy, engine power and engine life. A system that is not designed specifically for the engine it is fitted to is likely to increase emissions, reduce engine power, have poor fuel economy and reduce the life of the engine.

Non-original electronic chips or computers, whether fitted as a direct replacement or in a 'piggy-back' configuration, are not permitted to be used in an engine management system unless it can be demonstrated that their installation and use allows the vehicle to meet the appropriate ADR. They must also be sealed or otherwise constructed so as not to be reprogrammable.

8. Auxiliary and replacement fuel tank

Evaporative emissions (petrol vapour or 'hydrocarbons') are a significant component of pollution and are a cause of photochemical smog. Most fuel systems have a carbon canister that traps this fuel vapour and returns it to the engine or fuel tank for use.

Auxiliary or replacement fuel tanks are to be constructed and installed to the appropriate safety standards and regulatory requirements.

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Any additional or replacement petrol tanks must incorporate facilities for the control of evaporative emissions. They must have the same connections and facilities that are provided on the original tank. The filler necks must be the correct size, and labelled if required.

There must be sufficient capacity within the evaporative emission control system to control evaporative emissions from the auxiliary or replacement tank. Provided an evaporative emissions canister is fitted from a production vehicle that has a total fuel capacity in excess of your modified fuel capacity, this requirement would be met.

9. Exhaust manifolds

Some exhaust manifolds (such as headers or extractors) incorporate devices, sensors and systems that enable the correct function of different pollution control systems. If these are not functioning, an increase in exhaust pollution can occur.

Different exhaust manifolds are allowed, provided that:

- (a) they incorporate all provisions found on the original manifold for the connection of emission control devices and systems
- (b) such devices and systems are fitted and operate in the correct manner (exhaust manifolds must not interfere with the correct operation of any other emission control devices or systems).

10. Exhaust systems

Modifications to exhaust systems are permitted, providing the modifications do not conflict with other requirements of this document.

On vehicles fitted with one or more catalytic converters, all the exhaust gas must flow through the converters at all times when a vehicle is used on the road.

If modifying or replacing an exhaust system, make sure that the catalytic converter(s) and any sensors are positioned in the same exhaust flow location as with the original system. For example, some manufacturers put the catalytic converter close to the exhaust manifold so that it heats up very quickly when the vehicle is started. This enables the converter to function almost immediately. If placed further down the exhaust system, the converter cannot function as quickly and will allow uncontrolled exhaust emissions to be emitted.

11. Noise limits

The vehicle must not exceed the exhaust noise limits applicable to its date of manufacture. It is an offence to use, own or modify a vehicle so that it exceeds the maximum permitted noise level when the vehicle is driven on the road. If there is any doubt whether the vehicle exceeds the maximum limit, it is recommended that it be taken to an EPA-approved noise tester to be measured.

Maximum noise levels for stationary vehicles are not to exceed those in the following tables.

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Passenger vehicle (Other than a bus)

Date of manufacture	Noise level
Before 1 November 1983	96 dB(A)
After 1 November 1983	90 dB(A)

Motorcycle or tricycle

Date of manufacture	Noise level
Before 1 March 1985	100 dB(A)
After 1 March 1985	94 dB(A)

Trucks and buses

These are more complex. The maximum levels are dependent on the vehicle's gross mass, engine type, exhaust height and date of manufacture. These levels are set out in the Regulations.

It is an offence to own or use a vehicle fitted with a temporary defeat device, inlet port restrictor, exhaust port restrictor or temporary noise reduction device. These devices, when fitted to the exhaust system, can temporarily and easily change or vary the level of noise emitted from the exhaust. Examples include *variable exhaust restrictors, cut-outs, bypasses, adjustable/variable/sliding openings on mufflers, restrictive or temporary insert plates and steel wool.*

FURTHER INFORMATION

This publication is intended to provide general guidance only and does not cover every possible modification that can affect vehicle emissions. EPA is not responsible for any damage that could arise from modifications to any motor vehicle. No reader should act on the basis of any matter contained in this publication without first obtaining specific professional mechanical advice.

For individual circumstances and advice concerning your vehicle you should contact a member of the Vehicle Assessment Signatory Scheme (VASS) operated by VicRoads. Contact VicRoads or see its website at www.vicroads.vic.gov.au for a list of the current signatories.

In the event of a breach of the Act or the Regulations, EPA reserves the right to take enforcement action in accordance with EPA's enforcement policy should such action be required.

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