

# **Vehicle Standards Bulletin 14**

**NATIONAL CODE OF PRACTICE  
for  
LIGHT VEHICLE CONSTRUCTION  
and  
MODIFICATION**

**SECTION LA  
ENGINE**

**VERSION 2.0 JANUARY 2011**

## Vehicle Standards Bulletin 14

### **National Code of Practice for Light Vehicle Construction and Modification (VSB 14)**

#### **Important Information for Users**

Users of VSB 14 need to be aware that this document needs to be used in conjunction with the appropriate administrative requirements of the jurisdiction in which they wish to either register a vehicle or to obtain approval for a modification for an already registered vehicle. *Administrative requirements* include, amongst other things, processes for vehicle registration, obtaining exemptions, obtaining modification approvals, vehicle inspections, preparation and submission of reports and the payment of appropriate fees and charges.

If unsure of any of the requirements specified in VSB 14, or if more information is needed for any other issues concerning the administrative requirements, users should contact their relevant Registration Authority **prior** to commencing any work.

While VSB 14 provides advice on the construction of Individually Constructed Vehicles (ICVs) and the execution of modifications, it is not to be taken to be a design manual. Determination of component strength, performance, suitability and functionality must be either calculated or determined on a case by case basis by suitably qualified personnel experienced in each matter under consideration.

Users of VSB 14 also need to ensure that they refer to the most recent version of the relevant Section/s when working on a project. The version is identified by the version number and date on the face page of each Section. The version and date is also located in the footer of each page in each Section. On the website the version number is specified in the Section file name for easy identification.

If a project is taking a long time to complete, check the currency of the version you are using.

Users must be familiar with the provisions stated in the Preface and Introduction. These two Sections provide the necessary background information to assist users in understanding how VSB 14 is administered by Registration Authorities across Australia, on how it is structured, and the meaning of the types of modification codes specified in VSB 14. If not already done so, users should download them for study and reference.

Understanding these requirements is important to ensure that the correct processes are followed thereby reducing the likelihood of having work rejected by Registration Authorities.

Many of the Sections refer to other Sections within VSB 14 for further information or additional requirements. Users must read and apply all relevant Sections.

If in doubt about any issue concerning or contained in VSB 14, users should seek clarification from the appropriate State or Territory Registration Authority.

|                                                                                                                                                                                                                  |
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| <p><b>Please do not contact Vehicle Safety Standards (VSS) of the Australian Government Department of Infrastructure and Transport in Canberra about VSB 14. VSS provides the website as a service only.</b></p> |
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## Document Amendments by Version

### Version

### Amendments

#### Version 2

Published 1 January 2011

Mandatory upgrades for pre ADR vehicles that require certification under this Section of VSB 14 now include split or dual braking systems and collapsible steering columns.

Table LA1 has now been relocated to clause 2.13 of *General Requirements*.

Table LA1 now applies to all categories that require certification under this Section of VSB 14.

*Engine stops* for vehicles operating on diesel has been added.

This document has also a number of editorial amendments that have had no affect on its technical content.

# CONTENTS

|                                                          | Page      |
|----------------------------------------------------------|-----------|
| <b>1 Scope</b>                                           | <b>6</b>  |
| 1.1 Basic Modifications Not Requiring Certification      | 6         |
| 1.2 Modifications Requiring Certification Under LA Codes | 6         |
| <b>2 General Requirements</b>                            | <b>6</b>  |
| 2.1 Choice of Replacement Engine                         | 7         |
| 2.2 Modification to Engine Components                    | 7         |
| 2.3 Engine Mounts                                        | 7         |
| 2.4 Clearances                                           | 8         |
| 2.5 Guarding                                             | 8         |
| 2.6 Brake Booster                                        | 8         |
| 2.7 Exhaust System                                       | 8         |
| 2.8 Fuel System                                          | 9         |
| 2.9 Engine Cooling System                                | 10        |
| 2.10 Windscreen Demister System                          | 10        |
| 2.11 Electrical System                                   | 10        |
| 2.12 Fabrication                                         | 10        |
| 2.13 Engine Capacity                                     | 11        |
| 2.14 Nitrous Oxide Installations                         | 12        |
| <b>3 Australian Design Rules</b>                         | <b>13</b> |
| 3.1 Gaseous Emissions and Fuel Systems                   | 13        |
| 3.2 Noise                                                | 15        |
| <b>4 Basic Modifications without Certification</b>       | <b>15</b> |
| 4.1 Manufacturer's Optional Engine Installation          | 15        |
| 4.2 Engine Reconditioning                                | 15        |
| <b>5 Certified Modifications (LA Codes)</b>              | <b>16</b> |
| LA1 Equivalent Engine Installation                       | 17        |
| Checklist                                                | 20        |
| LA2 Performance Engine Installation                      | 23        |
| Checklist                                                | 26        |

|     |                                            |    |
|-----|--------------------------------------------|----|
| LA3 | Supercharger and Turbocharger Installation | 29 |
|     | Checklist                                  | 33 |
| LA4 | Engine Modifications                       | 36 |
|     | Checklist                                  | 39 |

## 1 SCOPE

Section LA outlines the minimum design, installation and fabrication requirements for the following light vehicle modifications involving engine substitutions and modifications.

### 1.1 BASIC MODIFICATIONS NOT REQUIRING CERTIFICATION

The following are *Basic Modifications* that may be performed without certification providing the modifications are carried out in compliance with the requirements detailed in Clause 2 *General Requirements*:

- Fitting a replacement new, used or reconditioned engine;
- Fitting a manufacturer's optional engine together with any associated components as supplied by the manufacturer for that same model vehicle;
- Fitting replacement original equipment engine and exhaust components;
- Fitting replacement original equipment, equivalent or better, components that have no influence on engine performance or emissions (e.g. higher volume oil pump than original); and
- Fitting equivalent engines with an increase of up to 20% of original power.

In all of the above cases, if the engine is modified, it must be certified under the relevant Code of Section LA.

### 1.2 MODIFICATIONS REQUIRING CERTIFICATION UNDER LA CODES

The following is a summary of modifications that may be performed under Section LA:

- Fitting engines greater than 120% of original power and/or engine mass;
- Fitting performance engines;
- Fitting engines from non original equipment sources;
- Installing a supercharger or turbocharger; and
- Modifying the engine and engine components that results in an increase in engine power of more than 20% and/or affects exhaust emissions.

## 2 GENERAL REQUIREMENTS

This subsection applies to all light vehicles and must be read and applied in conjunction with all the LA Codes applicable to the proposed modifications.

Modified vehicles must continue to comply with the Australian Design Rules (ADRs) to which they were originally constructed, except as allowed for in the Australian Vehicle Standards Rules (AVSR). These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

*Compliance with the AVSR* also means compliance with the equivalent regulations of a State or Territory of Australia.

## **2.1 CHOICE OF REPLACEMENT ENGINE**

A manufacturer's standard or optional engine should be selected and installed using all the standard components for that vehicle model. However, where this is not practicable, the following requirements should be met:

- Any replacement engine should be of similar mass and power output to that of an engine fitted by the original vehicle manufacturer as standard or optional equipment;
- When the replacement engine is larger in power output than an engine offered by the vehicle manufacturer as standard or optional equipment, the vehicle must be equipped with any necessary upgrading of equipment, e.g. brakes, front suspension, etc.; and
- The power and/or torque of the replacement engine must not exceed the capacity of the vehicle driveline.

Using the engine manufacturer's published specifications, the dimensions of the selected engine should be checked against the vehicle to ensure that:

- the engine, together with all of its components, fits into the available space without major frame, body or other modifications;
- the engine mass and location of centre of mass must not result in excessive mass on the front or rear suspension;
- the location of ancillary equipment, such as the cooling system, the intake and exhaust systems must be suitable for the vehicle layout; and
- the replacement engine must be installed in a position and on an angle that allows the driveline to operate correctly.

If the installation requires modifications to the vehicle structure, such as chassis rails and firewalls, the modification must be performed in accordance with the applicable LH Code(s).

## **2.2 MODIFICATION TO ENGINE COMPONENTS**

Substitution or replacement of components such as camshafts, carburettors, engine management systems, exhaust systems, etc. must not be carried out unless it can be demonstrated that the vehicle will continue to meet the appropriate gaseous and noise emission standards (refer to Codes LT3 and LT4 in Section LT *Test Procedures*).

## **2.3 ENGINE MOUNTS**

Providing detailed design guidelines for an engine/transmission support system is beyond the scope of this document. However, factors to be considered should include the following:

- The engine mounts must provide for vibration isolation between the engine and the body;
- The design and construction of the engine mounts must be adequate to withstand the torque output of the engine and the inertial forces from accelerating, braking and cornering; and

- The installation of replacement engine mounting brackets does not require certification under the LH Codes provided that sub-frames, chassis members or body members are not altered.

## **2.4 CLEARANCES**

The engine must clear all surrounding components in the engine bay at maximum engine movement including under maximum torque in both forward and reverse gears. A clearance of at least 10mm must be provided beyond that required for maximum engine movement.

Additional clearance must be provided to components likely to deteriorate from the heat from nearby engine and exhaust components. In particular, flexible fuel pipes, power steering hose and steering column shaft couplings incorporating rubber or fabric components must be placed well clear of hot exhaust components and shielded if necessary.

When fitting a replacement engine to a vehicle with a beam type front axle, sufficient clearance must be provided between the top of the axle, steering linkages and drive shaft (on four wheel drive vehicles) and the engine (usually the sump) to allow the axle full bump movement.

## **2.5 GUARDING**

To minimise the danger to any person working on the vehicle with the engine running, any exposed rotating parts should be guarded.

Radiator cooling fans should be fitted with guards to restrict access to the top of the fan.

Where guards were originally fitted, the guards must be retained.

## **2.6 BRAKE BOOSTER**

The vacuum hose between the brake booster (where fitted) and the inlet manifold must be securely fastened at each end using hose clamps or similar. The vacuum connection on the inlet manifold must be located in a position that ensures sufficiently low pressure at the brake booster. This is usually downstream of the throttle body or inlet butterfly on petrol engines.

Some highly modified engines might not develop the required low pressure in the inlet manifold at idle for proper functioning of the brake booster. In such cases, the vehicle must be fitted with a vacuum reservoir or vacuum pump to meet the ADR braking requirements.

In the case of a diesel engine conversion on a vehicle with vacuum boosted brakes, it must be fitted with a vacuum pump of capacity adequate to meet the ADR braking requirements.

## **2.7 EXHAUST SYSTEM**

Where possible, the muffler(s) and catalytic converter and/or particle trap from the exhaust system of the donor vehicle should be used.

Where alternative exhaust systems are fitted, the system must incorporate any engine emission control equipment, meeting the same standard, as that fitted in the exhaust system of the vehicle.

Where an exhaust system runs through an inner mudguard panel, the panel cut-out must not weaken the inner guard and if necessary, the panel must be reinforced to compensate for the cut-out. Exhaust systems passing through inner guard panels must clear the wheels, tyres and suspension components over the full range of travel of the suspension and steering.

Exhaust systems must be provided with appropriate shielding, a minimum of 100mm ground clearance and also meet the ground clearance requirements of ADR 43/... where applicable.

The outlet of an exhaust system must be rearwards of any passenger side entry door or opening window. If any part of the exhaust system, including the outlet pipe, extends beyond the profile of the body (other than on the underside), it must be shielded. Exhaust outlets must also meet the requirements of ADR 42/... where applicable. Vehicles manufactured after June 1988 must not have the exhaust exiting to the left of the vehicle.

Modified exhaust systems must not unnecessarily restrict the flow of exhaust gases and must be free of tight bends and other restrictive components.

## 2.8 FUEL SYSTEM

Only flexible hose specifically designed, manufactured and marked for use as a fuel hose, may be used for fuel supply or return in the fuel system. The pressure rating of the fuel hose must not be less than the operating pressure of the fuel system.

The ends of fuel hoses must be securely fastened with hose clamps or clips to prevent fuel leakage. In any event, the system used to secure the hoses or pipe joints must be suitable for the operating pressure of the fuel system.

Fuel lines must be positioned well clear of any component that can reach high temperatures and cause the fuel to vaporise or damage flexible fuel hoses. These components can include parts of the engine and accessories such as the exhaust system, turbocharger and air-conditioning compressor.

Fuel lines must be adequately supported and shielded where necessary to prevent damage from hot components and road debris.

Fuel lines must be adequately protected from chafing or damage where they pass through panels, bulkheads or chassis members.

Fuel vapour hoses or pipes associated with the evaporative emission system (charcoal canister) must be connected and the system must continue to operate as designed.

For more detail about fuel systems refer to Section LM *Fuel Systems*.

### 2.8.1 Engine Stops for Vehicles Operating on Diesel

The AVSR requires that a motor vehicle propelled by a compression ignition engine is fitted with a device that prevents the engine from being started accidentally or inadvertently. Vehicles fitted with diesel engines must therefore be equipped with a locking device that prevents the engine from being started accidentally or inadvertently.

If a cable operated fuel pump stop is used for this purpose, this control must remain in the *Off* position until such time as the engine is ready to be restarted. Later model diesel engines that have a solenoid operated fuel cut-off system must be able to be switched off using the ignition switch and only be started when the ignition switch is in the *Run* position.

If a solenoid operated fuel cut-off system is used, it must be able to be operated independently of the ignition switch.

If the engine has been *locked* it must only be capable of being started when the ignition switch is in the *Run* position.

## 2.9 ENGINE COOLING SYSTEM

Hoses between the radiator and the engine should allow for any movement between them. The hoses should be positioned and supported (if necessary) to avoid excessive force on their connections. Hoses must not be kinked.

The engine thermostat must not be removed. It is designed to enable the engine to quickly reach and remain at its normal operating temperature, which in turn reduces exhaust emissions.

The system should be designed to prevent cavitation at the coolant pump. This may be achieved by avoiding any restriction on the pump suction inlet and ensuring that the coolant level in the reservoir is higher than the highest point in the engine galleries and the coolant pump.

A close-fitting shroud should be mounted between the extremities of the radiator and the cooling fan to ensure efficient cooling (and to minimise danger from exposed rotating fan blades).

## 2.10 WINDSCREEN DEMISTER SYSTEM

Heater hoses that supply the windscreen demister system must be re-connected to ensure that it functions correctly.

## 2.11 ELECTRICAL SYSTEM

Electrical wires in wiring looms must be protected from mechanical damage by wrapping with tape or enclosing them in conduit, or other covering. Looms must be supported on the vehicle at positions no more than 600mm apart with allowance being made for the relative movement that can occur between the engine/transmission and the body/chassis.

The replacement engine's alternator output rating and the battery capacity should be compatible with the vehicle's electrical systems and the replacement engine.

Adequate protection from excessive heat should be provided for all electrical harnesses (and other hose, rubber and plastic components). All heat and noise insulation material as originally fitted should be retained.

With some engine substitutions the battery has to be relocated to the passenger or luggage compartment. Unless a special kind of battery (e.g. a *sealed gel cell*) is used in these locations, the battery must be fully enclosed and the enclosure vented to outside the vehicle. Electrically insulated enclosures such as sealed marine battery boxes should be used. The battery must be securely fastened to the vehicle. Battery cables must be shielded where necessary to prevent damage from road debris and be secured to the body at a maximum spacing of 600mm. Rubber grommets must be fitted where cables pass through holes in body panels and chassis sections.

## 2.12 FABRICATION

All work must be performed in accordance with recognised engineering standards. Cutting, heating, welding or bending of components should be avoided by choosing unmodified production components wherever possible.

### 2.12.1 Welding, Fasteners and Electroplating

Mandatory requirements and guidance on the above items are contained in Section LZ *Appendices*.

- For the use of fasteners refer to Appendix A *Fasteners*;
- For welding techniques and procedures refer to Appendix C *Heating and Welding of Steering Components*; and
- For electroplating refer to Appendix D *Electroplating*.

### 2.12.2 Mating Parts

Standard features such as splines, tapers and keyways must conform to published standards and their mating parts must conform to matching standards.

## 2.13 ENGINE CAPACITY

For certification purposes under Codes LA1, LA2, LA3 and LA4, the recommended maximum capacity (swept volume) of engines for passenger cars and passenger car derivatives is outlined in Table LA1 below. An engine may not be a suitable replacement even if its capacity falls within the limits specified in Table LA1. Owners are therefore advised to check details of a proposed engine conversion with an engineering signatory prior to commencing any work.

Table LA2 provides examples as to how the maximum engine capacity is determined.

The maximum engine capacity for rotary engines is calculated by multiplying the swept volume of all rotors by two (e.g. a 13B rotary engine has a swept volume of 1308 cc resulting in a calculated maximum capacity of 2616 cc). Table LA3 provides examples of how the engine capacity of rotary engines is determined.

Table LA1 does **not** apply to commercial (ADR Category NA and NB1) or four wheel drive off-road (ADR category MC) type vehicles such as commercial vans, light trucks, small buses, etc. for which there are no set recommended limits.

**Table LA1 Recommended Maximum Engine Capacity**

| MASS OF VEHICLE                                                      | Maximum Engine Capacity (refer to notes below)             |                                                             |
|----------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------|
|                                                                      | Naturally Aspirated                                        | Turbo/Supercharged                                          |
| All vehicles originally weighing less than <b>800 kg</b> .           | Original mass (kg) x <b>3.0</b><br>= max. capacity in cc's | Original mass (kg) x <b>2.5</b><br>= max. capacity in cc's  |
| All vehicles originally weighing between <b>800 kg and 1100 kg</b> . | Original mass (kg) x <b>4.0</b><br>= max. capacity in cc's | Original mass (kg) x <b>2.75</b><br>= max. capacity in cc's |
| All vehicles originally weighing more than <b>1100 kg</b> .          | Original mass (kg) x <b>5.0</b><br>= max. capacity in cc's | Original mass (kg) x <b>3.0</b><br>= max. capacity in cc's  |

**Table LA2 Examples of Maximum Recommended Engine Capacity**

| Vehicle                     | Naturally Aspirated       | Forced Induction             |
|-----------------------------|---------------------------|------------------------------|
| 1970 Corolla (4 cyl 746 kg) | <b>2238</b> cc (746 x 3)  | <b>1865</b> cc (746 x 2.5)   |
| 1977 Celica (4 cyl 1067 kg) | <b>4268</b> cc (1067 x 4) | <b>2934</b> cc (1067 x 2.75) |
| 1973 Falcon XBGT (1557 kg)  | <b>7785</b> cc (1557 x 5) | <b>4671</b> cc (1557 x 3)    |

**Table LA3 Examples of Maximum Recommended Engine Capacity for Rotary Engines**

| Rotary engines | Displacement | Sweep Volume | Maximum Capacity |
|----------------|--------------|--------------|------------------|
| 10A            | 491 cc x 2   | 982 cc       | 1964cc           |
| 12A            | 573 cc x 2   | 1146 cc      | 2292cc           |
| 13B            | 654 cc x 2   | 1308 cc      | 2616cc           |
| 20B            | 654 cc x 3   | 1962 cc      | 3924cc           |

### 2.13.1 Vehicle Mass

The mass of the vehicle referred to in Tables LA1, LA2 and LA3 is the original (unmodified) tare mass of the model vehicle fitted with the largest engine available for the model in Australia but without optional accessories (air conditioning, tow bars etc.). The mass of the vehicle, whether it is a sedan, station wagon, utility, etc., should be based on the heaviest sedan version of the model (**not** station wagon version) sold in Australia.

If the laden mass of the vehicle either on the front or rear wheels is more than 10% above that for the heaviest model version of the vehicle, then justification that the vehicle is capable of satisfactory operation at these loads is required. This must include analysis of axles, suspension, steering, braking, tyre capacity and speed rating.

If the mass on the original front and rear axle is not known, the mass increase on each axle may be estimated as follows:

- Subtract the original total mass of the vehicle from the new total mass (after modifications);
- Distribute the difference according to the locations of the components contributing to any mass increase (i.e. engine, transmission, etc.); and
- Subtract the distributed amounts from the front and rear mass of the modified vehicle to obtain an estimate of the original mass attributed to the front and rear axle.

## 2.14 NITROUS OXIDE INSTALLATIONS

Nitrous oxide injection systems must not be fitted. This prohibition includes a partial installation or a disconnectable nitrous oxide system that is fitted to the vehicle ready for use.

### 3 AUSTRALIAN DESIGN RULES

Any engine modification that affects gaseous emissions or noise may detrimentally affect compliance with the ADRs that specify requirements for engine emissions and noise.

Some engine changes may also detrimentally affect compliance with other ADRs such as braking (diesel engine lack of vacuum) and windscreen demisting (air-cooled engines).

Generally when an engine of different design is substituted, the gaseous emission control system of the donor vehicle, from air intake right through the engine to the exhaust outlet, should be utilised as a package.

A modified vehicle must continue to comply with the ADRs applicable to that vehicle, including exemptions allowed for in the AVSR.

To determine the ADRs that apply to the vehicle in question, refer to the applicability tables in Section LO. Vehicles manufactured on or after 1 January 1969 and prior to 1 July 1988 need to comply with the Second Edition ADRs, while vehicles manufactured after this date need to comply with the Third Edition ADRs. Section LO has separate applicability tables for each edition.

Alternatively, ADR applicability tables for individual vehicle categories may be referenced on the Department of Infrastructure and Transport RVCS website at the following address and under the section titled *ADR Applicability Tables*:

**<http://rvcs.dotars.gov.au/>**

Additional information about ADR gaseous emission requirements is contained in Section LZ Appendices - *Appendix F Summary of Emission Requirements for New Light Vehicles in Australia*.

#### 3.1 GASEOUS EMISSIONS AND FUEL SYSTEMS

##### 3.1.1 Background

The requirements to limit gaseous emissions were introduced in ADR 26 in 1972 when passenger vehicles were required to be fitted with a positive crank case ventilation system (PCV). PCV systems prevented blow-by gases escaping into the atmosphere and carbon monoxide emissions were limited.

The requirements have become progressively more stringent and the current rules now apply to all light and heavy commercial vehicles (ADR 79 and ADR 80).

All passenger vehicles built on or after 1 July 1976 were required to be fitted with an effective evaporative emission control system to comply with ADR 27A. This system comprised a carbon canister connected to the fuel tank and induction system.

All passenger vehicles built on or after January 1986 were required to be fitted with an engine that complied with ADR 37 and ran on unleaded fuel. These vehicles were required to be fitted with a narrow fuel filler with a flap to prevent incorrect refuelling. The need to fit a narrow fuel filler with a flap is now no longer mandatory.

Most diesel engine vehicles manufactured on or after 1 July 1976 were required to comply with ADR 30 and the engines were labelled accordingly.

### 3.1.2 Alternative Replacement Engines for Pre-1986 Passenger Vehicles

Because of the difficulty in identifying the year of manufacture of some replacement engines or the unavailability of replacement emission control equipment for ADR 27 engines, it is recommended that a replacement engine designed for use with unleaded fuel and complying with ADR 37 be used where possible. Where this is impractical the following alternative is acceptable for replacement engines for pre-1986 passenger vehicles:

- Convert the replacement engine to run on unleaded fuel (now a necessity);
- Fit new catalytic converter(s) where appropriate;
- Fit unleaded fuel filler with flap (optional);
- Operate the vehicle on unleaded fuel; and
- Ensure the engine is well maintained – alternatively overhaul and retune the engine.

### 3.1.3 Aftermarket Engine-Management Computers

The use of aftermarket engine management computers (not OEM) does not guarantee compliance with the relevant ADR unless that particular computer/engine combination has undergone ADR emission testing and the evidence of compliance is available (refer to Code LT3). If no evidence is available, the vehicle must be tested in accordance with the applicable ADRs.

### 3.1.4 Gaseous Emission ADRs

Table LA4 lists the ADRs that specify gaseous emissions:

**Table LA4      Gaseous Emission Related ADRs**

| ADRs               | Title                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 26 and 27x         | Vehicle Engine Emission and Vehicle Engine Emission Control                                                                           |
| 30, 30/..., 79/... | Diesel Engine Exhaust Smoke Emissions                                                                                                 |
| 36x, 36/...        | Exhaust Emission Control for Heavy Duty Vehicles                                                                                      |
| 37                 | Vehicle Emission Control                                                                                                              |
| 37/...             | Emission Control for Light Vehicles                                                                                                   |
| 40                 | Light Duty Vehicle Emission Control                                                                                                   |
| 41, 41/...         | Mandatory Operation on Unleaded Petrol                                                                                                |
| 44/...             | Specific Purpose Vehicle Requirements (LPG)                                                                                           |
| 70/...             | Exhaust Emission Control for Diesel Engine Vehicles                                                                                   |
| 79/...             | Emission Control for Light Vehicles                                                                                                   |
| 80/...             | Emission Control for Heavy Vehicles (this ADR applies to vehicles of the M and N ADR categories, with a GVM greater than 3.5 tonnes). |

Further information about emission levels can be found in Section LZ *Appendices* in Appendix F *Summary of Emission Requirements for New Light Vehicles in Australia*.

### 3.2 NOISE

Modified vehicles must continue to comply with the ADRs applicable to the vehicle's date of manufacture and ADR category, or the in-service vehicle standard rules for noise emissions as specified in the AVSR.

If the engine and appropriate exhaust system components from a vehicle known to comply with the relevant ADR (or a later ADR) are fitted, the modified vehicle is deemed to comply with the ADR.

In all other cases the vehicle must be tested in accordance with the relevant ADR or with Code LT4 of Section LT *Test Procedures*.

Table LA5 lists ADRs relating to exhaust systems and noise emissions:

**Table LA5 External Noise ADRs**

| ADRS        | Title and Comments                                      |
|-------------|---------------------------------------------------------|
| 28x, 28/... | External Noise of Motor Vehicles                        |
| 42/...      | General Safety Requirements (exhaust outlets)           |
| 43/...      | Vehicle Configuration and Dimensions (ground clearance) |
| 83/...      | External Noise                                          |

## 4 BASIC MODIFICATIONS WITHOUT CERTIFICATION

The following *Basic Modifications* may be carried out without certification provided that they are in conformity with the relevant clauses of sub-section 2 *General Requirements*, they do not affect compliance with applicable ADRs or AVSRs and provided they meet the following requirements.

### 4.1 MANUFACTURER'S OPTIONAL ENGINE INSTALLATION

Substituting the original engine with a manufacturer's optional engine is a modification that does not require certification. However, any other components (such as brakes, transmissions, suspension, exhaust, etc.) that were packaged by the manufacturer as part of the original specification for the optional engine must also be fitted.

### 4.2 ENGINE RECONDITIONING

Reconditioning an engine is not a modification and therefore does not require certification, providing the engine remains within the manufacturer's specification limits.

Where gaseous and/or noise emission ADRs apply, all standard equipment (such as carburettors, engine management computers, exhaust systems, exhaust gas recirculating valves, oxygen sensors, catalytic converters, etc.), relating to noise and emission control must be retained and operate correctly. Any replacement parts should be of a standard equivalent to the original equipment.

## 5 CERTIFIED MODIFICATIONS (LA CODES)

This section specifies particular requirements and covers limitations on modifications that may be performed under individual LA Codes.

Each Code is supplemented with a checklist (refer to Table LA6).

**Table LA6 LA Code Directory**

| LA Codes |                                            | Page |
|----------|--------------------------------------------|------|
| LA1      | Equivalent Engine Installation             | 17   |
|          | Checklist                                  | 20   |
| LA2      | Performance Engine Installation            | 23   |
|          | Checklist                                  | 26   |
| LA3      | Supercharger and Turbocharger Installation | 29   |
|          | Checklist                                  | 33   |
| LA4      | Engine Modifications                       | 36   |
|          | Checklist                                  | 39   |

## EQUIVALENT ENGINE INSTALLATION

### CODE LA1

#### SCOPE

This modification code covers the installation of non original equipment engines with not more than 20% greater mass and/or power output than engines offered by the vehicle's first manufacturer as a standard or optional engine.

**Code LA1 does not apply to ADR category L-Group vehicles and motorcycles.**

#### MODIFICATIONS COVERED UNDER CODE LA1

The following modifications may be performed under Code LA1:

- Fitting of a replacement engine with not more than 20% greater mass and/or power output than engines offered by the first manufacturer as a standard or optional engine.

#### MODIFICATIONS NOT COVERED UNDER CODE LA1

The following is a summary of the modifications that may not be performed under Code LA1:

- Fitting of a replacement engine that does not comply with the applicable ADRs;
- Fitting of a replacement engine of which the specifications are not suitable for use with the existing components of the vehicle; and
- Fitting of a replacement engine that necessitates substantial modification to the vehicle's structure (e.g. firewall, chassis modifications) or where any structural changes compromise the vehicle's ability to continue to comply with the occupant protection ADRs.

#### COMPLIANCE WITH APPLICABLE VEHICLE STANDARDS

Modified vehicles must continue to comply with the ADRs to which they were originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

*Compliance with the AVSR* also means compliance with the equivalent regulations of a State or Territory of Australia.

Outlined below in Table LA7 are areas of the vehicle that may be affected by the modifications and that may require re-certification, testing and/or data to show compliance for the modified vehicle. This is not an exhaustive list and other modifications may also affect ADR compliance.

**Table LA7 Summary of items that if modified or altered, may detrimentally affect compliance with applicable ADRs**

| DETAIL                         | REQUIREMENTS                                         |
|--------------------------------|------------------------------------------------------|
| Gaseous Emissions              | ADR 27x, 30, 36x, 37, 37/..., 70/..., 79/..., 80/... |
| External Noise                 | ADR 28x, 28/..., 83/...                              |
| Brake System (vacuum recharge) | ADR 31, 31/..., 35x, 35/...                          |
| Exhaust Outlets                | ADR 42/...                                           |
| Ground Clearance               | ADR 43/...                                           |

To determine the ADRs that apply to the vehicle in question, refer to the applicability tables in Section LO. Vehicles manufactured on or after 1 January 1969 and prior to 1 July 1988 need to comply with the Second Edition ADRs while vehicles manufactured after this date need to comply with the Third Edition ADRs. Section LO has separate applicability tables for each edition.

Alternatively, ADR applicability tables for individual vehicle categories may be referenced on the Department of Infrastructure and Transport RVCS website at the following address and under the section titled *ADR Applicability Tables*:

**<http://rvcs.dotars.gov.au/>**

The ADRs apply according to the vehicle's category and date of manufacture. It is the responsibility of the signatory to refer to the appropriate ADR applicable to the vehicle.

## **SPECIFIC REQUIREMENTS**

The replacement engine should be of similar mass and power output (i.e. an increase of not more than 20%) to that of an engine fitted by the original vehicle manufacturer as standard or optional equipment.

The power and/or torque of the replacement engine should not exceed the capacity of the vehicle driveline.

Using the engine manufacturer's published specifications, the dimensions of the selected engine should be checked against the vehicle to ensure that:

- the engine fits into the available space without major frame, body or other modifications;
- the engine mass and location of centre of mass must not result in an unacceptable front or rear suspension loading;
- the location of engine ancillaries, such as the cooling system and intake and exhaust systems must be suitable for the vehicle layout;
- the replacement engine should be installed in a position and angle, that allows the driveline to operate correctly without excessive vibration or undue stresses on couplings; and

- the fitting of additional intercoolers or larger radiators do not require structural changes to the front of the vehicle that may affect the vehicle's ability to continue to comply with the occupant protection ADRs or which may require the removal or relocation of airbag sensors.

When engines are modified by using alternative components such as camshafts, carburettors, injectors and engine management systems, proof of compliance with the relevant ADR is required (refer to Code LT3 - *Gaseous Emissions Test* in Section LT *Test Procedures*).

When engines are fitted with modified exhaust systems, proof of compliance with the relevant standards is required (refer to Code LT4 - *Noise Emissions Test* in Section LT *Test Procedures*).

**CHECKLIST**  
**EQUIVALENT ENGINE INSTALLATION**  
**CODE LA1**

(N/A=Not Applicable, Y=Yes, N=No)

|          |                                                                                                                                                                                                                          |     |   |   |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|---|
| <b>1</b> | <b>ENGINE</b>                                                                                                                                                                                                            |     |   |   |
| 1.1      | Is the mass and power output of the replacement engine not more than 20% greater than that of any engine offered by the original manufacturer for that model?                                                            |     | Y | N |
| 1.2      | Does the engine and installation comply with all relevant ADRs and/or in-service rules (i.e. smoke, gaseous emissions and noise)?                                                                                        |     | Y | N |
| 1.3      | LT3 Approval Reference Number (Gaseous Emission Test).....                                                                                                                                                               | N/A |   |   |
| 1.4      | LT4 Approval Reference Number (Noise Test).....                                                                                                                                                                          | N/A |   |   |
| <b>2</b> | <b>INSTALLATION</b>                                                                                                                                                                                                      |     |   |   |
| 2.1      | <b>General Requirements</b>                                                                                                                                                                                              |     |   |   |
|          | Does the replacement engine installation comply with all of the <i>General Requirements</i> of sub-sections 2.1 to 2.14 of this Section?                                                                                 |     | Y | N |
| 2.2      | <b>Strength</b>                                                                                                                                                                                                          |     |   |   |
|          | Has the engine been fitted without the alteration of the vehicle's chassis, sub-frames, cross-members or body members? If not, has the alteration been performed in accordance with Section LH <i>Body and Chassis</i> ? |     | Y | N |
|          | Has the strength of all components modified or affected by modification been verified as equivalent to the original manufacturer's specifications?                                                                       | N/A | Y | N |
|          | Are the engine mountings designed to withstand the torsional loads transmitted by the replacement engine?                                                                                                                |     | Y | N |
| 2.3      | <b>Fasteners</b>                                                                                                                                                                                                         |     |   |   |
|          | Do all fasteners comply with the applicable requirements of Section LZ <i>Appendices - Appendix A Fasteners</i> ?                                                                                                        | N/A | Y | N |
| 2.4      | <b>Protection</b>                                                                                                                                                                                                        |     |   |   |
|          | Has adequate protection been provided for all hoses, electrical harnesses, and rubber or plastic components?                                                                                                             |     | Y | N |
|          | Are fuel lines securely fastened and clear of high temperature components such as the exhaust system, turbocharger and air conditioning compressor?                                                                      |     | Y | N |

[Continued overleaf]

(N/A=Not Applicable, Y=Yes, N=No)

|     |                                                                                                                                                                                                                                                                         |     |   |   |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|---|
| 2.5 | <b>Workmanship</b>                                                                                                                                                                                                                                                      |     |   |   |
|     | Is all work, including welding, of satisfactory quality and has all work been performed in accordance with recognised engineering standards?                                                                                                                            |     | Y | N |
| 2.6 | <b>Diesel Engines</b>                                                                                                                                                                                                                                                   |     |   |   |
|     | If the vehicle is fitted with a replacement diesel engine, is an engine stop control (which will prevent accidental or inadvertent starting) fitted within the engine compartment?                                                                                      | N/A | Y | N |
|     | If the vehicle is fitted with a replacement diesel engine that is fitted with a solenoid control fuel cut-off system, is the engine able to be switched off from the ignition switch and can it only be started when the ignition switch is in the <i>Run</i> position? | N/A | Y | N |
|     | If the vehicle has vacuum assisted brakes and a replacement diesel engine is fitted, has a vacuum pump of adequate capacity been fitted to ensure the braking system continues to comply with the ADR braking requirements?                                             | N/A | Y | N |

**Note:** If the answer to any question is **N (No)**, the modification cannot be certified under Code LA1.

[Continued overleaf]

| REPLACEMENT ENGINE DETAILS    |  |                       |  |
|-------------------------------|--|-----------------------|--|
| Make                          |  | Type                  |  |
| Number of Cylinders or Rotors |  | Displacement (Litres) |  |
| Maximum Power Output (kW)     |  | Engine Mass (kg)      |  |

| CERTIFICATION DETAILS                 |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
|---------------------------------------|--|--|--|--|--|-------|--|--|--|--|--|---------------------|--|--|--|--|--|
| Make                                  |  |  |  |  |  | Model |  |  |  |  |  | Year of Manufacture |  |  |  |  |  |
| VIN                                   |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Chassis Number (If applicable)        |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Brief Description of Modification/s   |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Vehicle Modified By                   |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Certificate Number (If applicable)    |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Vehicle Certified By ( <i>Print</i> ) |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Signatory's Employer (If applicable)  |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Signatory's Signature                 |  |  |  |  |  |       |  |  |  |  |  | Date                |  |  |  |  |  |

## PERFORMANCE ENGINE INSTALLATION

### CODE LA2

#### SCOPE

Code LA2 covers the fitting of a replacement engine with more than 20% greater mass and/or power output than engines offered by the vehicle's first manufacturer as a standard or optional engines.

**Code LA2 does not apply to ADR category L-Group vehicles and motorcycles.**

#### MODIFICATIONS COVERED UNDER CODE LA2

The following modifications may be performed under Code LA2:

- Fitting of a replacement engine with more than 20% greater mass and/or power output than engines offered by the first manufacturer as a standard or optional engine in accordance with guidelines set out in Specific Requirements.

#### MODIFICATIONS NOT COVERED UNDER CODE LA2

The following is a summary of the modifications that may not be performed under Code LA2:

- Fitting of a replacement engine that does not comply with the applicable ADRs;
- Fitting of a replacement engine, the specifications of which are not suitable for use with the existing components of the vehicle;
- Fitting of a replacement engine that requires substantial modification to the vehicle's structure (e.g. firewall, chassis modifications); and
- Fitting of a replacement engine less than 20% more powerful or heavier than any engine offered by the first manufacturer as a standard or optional engine (This is covered by Code LA1).

#### COMPLIANCE WITH APPLICABLE VEHICLE STANDARDS

Modified vehicles must continue to comply with the ADRs to which they were originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

*Compliance with the AVSR* also means compliance with the equivalent regulations of a State or Territory of Australia.

Outlined below in Table LA8 are areas of the vehicle that may be affected by the modifications and that may require re-certification, testing and/or data to show compliance for the modified vehicle. This is not an exhaustive list and other modifications may also affect ADR compliance.

**Table LA8 Summary of items that if modified or altered, may detrimentally affect compliance with applicable ADRs**

| DETAIL                         | REQUIREMENTS                                                   |
|--------------------------------|----------------------------------------------------------------|
| Emissions                      | ADR 27x, 30, 36x, 37, 37/..., 70/..., 79/..., 80/...           |
| External Noise                 | ADR 28x, 28/..., 83/...                                        |
| Brake System (vacuum recharge) | ADR 31, 31/..., 35x, 35/...                                    |
| Exhaust Outlets                | ADR 42/...                                                     |
| Ground Clearance               | ADR 43/...                                                     |
| Occupant Safety                | ADR 69/... (If the front of the vehicle is seriously modified) |

To determine the ADRs that apply to the vehicle in question, refer to the applicability tables in Section LO. Vehicles manufactured on or after 1 January 1969 and prior to 1 July 1988 need to comply with the Second Edition ADRs while vehicles manufactured after this date need to comply with the Third Edition ADRs. Section LO has separate applicability tables for each edition.

Alternatively, ADR applicability tables for individual vehicle categories may be referenced on the Department of Infrastructure and Transport RVCS website at the following address and under the section titled *ADR Applicability Tables*:

**<http://rvcs.dotars.gov.au/>**

The ADRs apply according to the vehicle's category and date of manufacture. It is the responsibility of the signatory to refer to the appropriate ADR applicable to the vehicle.

## **SPECIFIC REQUIREMENTS**

The following requirements apply to performance engine installations.

### **1 ENGINE CAPACITY**

The recommended maximum capacity (swept volume) of engines for passenger cars and passenger car derivatives under Code LA2 is outlined in Table LA1. An engine may not be a suitable replacement even if its capacity falls within the limits specified in Table LA1.

Table LA1 does **not** apply to commercial or four wheel drive type vehicles such as commercial vans, light trucks, small buses, etc. for which there are no set recommended limits.

### **2 MODIFICATIONS TO ENGINE COMPONENTS**

When ADR complying engines are modified by using alternative components such as camshafts, carburettors and engine management systems, proof of compliance with any relevant emission ADR is required (refer to Code LT3 *Gaseous Emissions Test* in Section LT *Test Procedures*).

### 3 MODIFIED EXHAUST SYSTEMS

When exhaust systems are modified, proof of compliance with the relevant ADR or AVSR is required (refer to Code LT4 - *Noise Emissions Test* in Section LT *Test Procedures*).

### 4 MANDATORY SAFETY EQUIPMENT UPGRADES FOR PRE-ADR VEHICLES

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:

- Seatbelts must be installed for all seating positions (all outboard seating positions require retractor type lap/sash seatbelts and inboard seating positions either lap/sash or lap belts (refer to Section LK *Occupant Protection*));
- Split or dual braking system - a dual system offers a greater degree of safety in the event of partial braking system failures. Fluid loss in one part of the system still allows the non-affected circuit to stop the vehicle, albeit with a longer braking distance (refer to Section LG *Brakes*);
- Windscreen washers must be fitted;
- Two speed windscreen wipers with a fast speed of at least 45 cycles per minute (cpm) and a slow speed of at least 20 cpm must be fitted (single speed wipers are acceptable if the speed is 45 cpm or more);
- A windscreen demister must be fitted;
- A flat or convex external rear vision mirror complying with the latest version of ADR14 must be fitted to the driver's side of the vehicle;
- If there is no effective internal rear vision mirror, a passenger's side external mirror must be fitted;
- Flashing direction indicator lights must be fitted at the front and rear of the vehicle;
- To ensure safe operation of a vehicle the signatory may specify a higher tyre speed rating than the original specifications and the fitting of an additional tyre placard indicating the minimum tyre requirements. The load rating of tyres must not be reduced from that specified by the vehicle manufacturer. For more comprehensive details on allowable tyre and rim modifications refer to Section LS *Tyres, Rims, Suspension and Steering*; and
- A collapsible steering column must be fitted.

## CHECKLIST LA2

## PERFORMANCE ENGINE INSTALLATION

## CODE LA2

(N/A=Not Applicable, Y=Yes, N=No)

|          |                                                                                                                                                                                                                          |     |   |   |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|---|
| <b>1</b> | <b>ENGINE</b>                                                                                                                                                                                                            |     |   |   |
| 1.1      | Does the replacement engine comply with the requirements of Table LA1 of this Code?                                                                                                                                      | N/A | Y | N |
| 1.2      | Does the engine and installation comply with all relevant ADRs and/or in-service rules (i.e. smoke, gaseous emissions and noise)?                                                                                        |     | Y | N |
| 1.3      | Insert Code LT3 Approval Reference Number.....                                                                                                                                                                           | N/A |   |   |
| 1.4      | Insert Code LT4 Approval Reference Number.....                                                                                                                                                                           | N/A |   |   |
| <b>2</b> | <b>INSTALLATION</b>                                                                                                                                                                                                      |     |   |   |
| 2.1      | <b>General Requirements</b>                                                                                                                                                                                              |     |   |   |
|          | Does the replacement engine installation comply with all of the <i>General Requirements</i> of sub-sections 2.1 to 2.14 of this Section?                                                                                 |     | Y | N |
| 2.2      | <b>Strength</b>                                                                                                                                                                                                          |     |   |   |
|          | Has the engine been fitted without the alteration of the vehicle's chassis, sub-frames, cross-members or body members? If not, has the alteration been performed in accordance with Section LH <i>Body and Chassis</i> ? |     | Y | N |
|          | Has the strength of all components modified or affected by modification been verified as equivalent to the original manufacturer's specifications?                                                                       | N/A | Y | N |
|          | Are the engine mountings designed to withstand the torsional loads transmitted by the replacement engine?                                                                                                                |     | Y | N |
| 2.3      | <b>Fasteners</b>                                                                                                                                                                                                         |     |   |   |
|          | Do all fasteners comply with the applicable requirements of Section LZ <i>Appendices - Appendix A Fasteners</i> ?                                                                                                        | N/A | Y | N |
| 2.4      | <b>Protection</b>                                                                                                                                                                                                        |     |   |   |
|          | Has adequate protection been provided for all hoses, electrical harnesses, and rubber or plastic components?                                                                                                             |     | Y | N |
|          | Are fuel lines securely fastened and clear of high temperature components such as the exhaust system, turbocharger and air conditioning compressor?                                                                      |     | Y | N |

[Continued overleaf]

(N/A=Not Applicable, Y=Yes, N=No)

|          |                                                                                                                                                                    |     |   |   |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|---|
| 2.5      | <b>Workmanship</b>                                                                                                                                                 |     |   |   |
|          | Is all work, including welding, of satisfactory quality and has all work been performed in accordance with recognised engineering standards?                       |     | Y | N |
| <b>3</b> | <b>SAFETY UPGRADE</b>                                                                                                                                              |     |   |   |
| 3.1      | Has the vehicle been upgraded to comply with all of the specific requirements outlined above in Code LA2?                                                          | N/A | Y | N |
| 3.2      | For vehicles with a modified braking system, has the design been certified to the requirements of Code LG1?<br><br>Insert Code LG1 Approval Reference Number ..... | N/A | Y | N |
| 3.3      | For vehicles with a modified braking system, have the completed modifications been certified to the requirements of Code LG2?                                      | N/A | Y | N |
| 3.4      | Are all additional checklists for modifications not covered by Section LA completed and attached?                                                                  | N/A | Y | N |

**Note:** If the answer to any question is **N (No)**, the modification cannot be certified under Code LA2.

| ENGINE DETAILS                |  |                       |  |
|-------------------------------|--|-----------------------|--|
| Make                          |  | Type                  |  |
| Number of Cylinders or Rotors |  | Displacement (Litres) |  |
| Maximum Power Output (kW)     |  | Engine Mass (kg)      |  |

[Continued overleaf]

| CERTIFICATION DETAILS                   |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |  |
|-----------------------------------------|--|--|--|--|--|-------|--|--|--|--|--|---------------------|--|--|--|--|--|--|
| Make                                    |  |  |  |  |  | Model |  |  |  |  |  | Year of Manufacture |  |  |  |  |  |  |
| VIN                                     |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |  |
| Chassis Number<br>(If applicable)       |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |  |
| Brief Description of<br>Modification/s  |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |  |
| Vehicle Modified By                     |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |  |
| Certificate Number<br>(If applicable)   |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |  |
| Vehicle Certified By ( <i>Print</i> )   |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |  |
| Signatory's Employer<br>(If applicable) |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |  |
| Signatory's Signature                   |  |  |  |  |  |       |  |  |  |  |  | Date                |  |  |  |  |  |  |

## SUPERCHARGER AND TURBOCHARGER INSTALLATION

### CODE LA3

#### SCOPE

Code LA3 covers the fitting of turbochargers or superchargers not originally offered by the engine or vehicle manufacturer.

**Code LA3 does not apply to ADR category L-Group vehicles and motorcycles.**

#### MODIFICATIONS COVERED UNDER CODE LA3

The following modifications may be performed under Code LA3:

- Fitting of turbochargers or superchargers not originally offered by the engine or vehicle manufacturer.

#### MODIFICATIONS NOT COVERED UNDER CODE LA3

The following is a summary of the modifications that may not be performed under Code LA3:

- Fitting of replacement engines already fitted with a turbocharger or supercharger by the engine manufacturer (these are usually covered by Code LA2); and
- Fitting of turbochargers or superchargers that cause the vehicle not to meet the required gaseous emission standards.

#### COMPLIANCE WITH APPLICABLE VEHICLE STANDARDS.

Modified vehicles must continue to comply with the ADRs to which they were originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

*Compliance with the AVSR* also means compliance with the equivalent regulations of a State or Territory of Australia.

Outlined below in Table LA9 are areas of the vehicle that may be affected by the modifications and that may require re-certification, testing and/or data to show compliance for the modified vehicle. This is not an exhaustive list and other modifications may also affect ADR compliance.

**Table LA9 Summary of items that if modified or altered, may detrimentally affect compliance with applicable ADRs**

| DETAIL                         | REQUIREMENTS                                                             |
|--------------------------------|--------------------------------------------------------------------------|
| Emissions                      | ADR 27x, 30, 30/..., 36x, 36/..., 37, 37/..., 40, 70/..., 79/..., 80/... |
| External Noise                 | ADR 28x, 28/..., 83/...                                                  |
| Brake System (vacuum recharge) | ADR 31, 31/..., 35x, 35/...                                              |
| Exhaust Outlets                | ADR 42/...                                                               |
| Ground Clearance               | ADR 43/...                                                               |

To determine the ADRs that apply to the vehicle in question, refer to the applicability tables in Section LO. Vehicles manufactured on or after 1 January 1969 and prior to 1 July 1988 need to comply with the Second Edition ADRs while vehicles manufactured after this date need to comply with the Third Edition ADRs. Section LO has separate applicability tables for each edition.

Alternatively, ADR applicability tables for individual vehicle categories may be referenced on the Department of Infrastructure and Transport RVCS website at the following address and under the section titled *ADR Applicability Tables*:

**<http://rvcs.dotars.gov.au/>**

The ADRs apply according to the vehicle's category and date of manufacture. It is the responsibility of the signatory to refer to the appropriate ADR applicable to the vehicle.

## **SPECIFIC REQUIREMENTS**

The following requirements apply to turbocharger and supercharger installations.

### **1 CERTIFICATION OPTIONS**

Forced induction conversions such as turbocharging or supercharging have the capacity to substantially increase a vehicle's power and performance and are generally considered on the same basis as a performance engine conversion.

The following are the options for certifying turbocharger and supercharger installations:

- A turbocharger (or supercharger) installation does not require certification, if the installation is available as an option from the original vehicle manufacturer. All vehicle components that were supplied by the manufacturer as part of the original specification for the turbocharged vehicle must also be fitted.
- A turbocharger (or supercharger) installation can be performed under Code LA1 only if the original engine was supplied with a turbocharged option and a non original equipment turbocharger (or supercharger) is fitted that does not increase the original most powerful engine power output by more than 20%.
- A non original equipment engine with its turbocharger/supercharger may be installed under Code LA1 provided the power output is not 20% more than the most powerful optional engine offered by the manufacturer for that vehicle model.

- A turbocharger (or supercharger) installation can be performed under Code LA2 only if the original engine was supplied with a turbocharged option and a non original equipment turbocharger (or supercharger) is fitted that increases the original most powerful engine power output by more than 20%.

A non original engine with its turbocharger/supercharger may be installed under Code LA2 if the power output is 20% more than the most powerful optional engine offered by the manufacturer for that vehicle model.

All other turbocharger and supercharger installations will require certification under Code LA3.

## **2 ENGINE MODIFICATIONS**

When engines are modified, by fitting turbochargers and/or superchargers (with or without alternative components such as camshafts, carburettors and engine management systems), proof of compliance with the relevant ADR is required (refer to Code LT3 *Gaseous Emissions Test* in Section LT *Test Procedures*).

## **3 MODIFIED EXHAUST SYSTEMS**

When exhaust systems are modified, proof of compliance with the relevant ADR or in-service vehicle rule is required (refer to Code LT4 - *Noise Emissions Test* in Section LT *Test Procedures*).

## **4 HEAT SHIELDING AND CLEARANCES**

All fuel, lubrication, cooling, brake and electrical components that are located in close proximity to a turbocharger must be shielded to prevent excessive heat affecting the performance or safety of these components. Shielding or increased clearances should also be used to prevent modified exhaust systems transferring excessive heat into the firewall and front floor areas of the body.

## **5 MODIFIED BONNETS**

Any supercharger and induction system components projecting above the original bonnet line must be covered with an appropriate raised bonnet section meeting the height and visibility requirements detailed in Section LH and designed to minimise injury to persons struck by the vehicle.

## **6 DRIVE BELTS**

Supercharger drive belts and pulleys must be shielded to prevent injury from accidental contact with rotating components.

## **7 MANDATORY SAFETY EQUIPMENT UPGRADES FOR PRE-ADR VEHICLES**

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:

- Seatbelts must be installed for all seating positions (all outboard seating positions require retractor type lap/sash seatbelts and inboard seating positions either lap/sash or lap belts (refer to Section LK *Occupant Protection*));

- Split or dual braking system - a dual system offers a greater degree of safety in the event of partial braking system failures. Fluid loss in one part of the system still allows the non-affected circuit to stop the vehicle, albeit with a longer braking distance (refer to Section LG *Brakes*);
- Windscreen washers must be fitted;
- Two speed windscreen wipers with a fast speed of at least 45 cycles per minute (cpm) and a slow speed of at least 20 cpm must be fitted (single speed wipers are acceptable if the speed is 45 cpm or more);
- A windscreen demister must be fitted;
- A flat or convex external rear vision mirror complying with the latest version of ADR14 must be fitted to the driver's side of the vehicle;
- If there is no effective internal rear vision mirror, a passenger's side external mirror must be fitted;
- Flashing direction indicator lights must be fitted at the front and rear of the vehicle;
- To ensure safe operation of a vehicle the signatory may specify a higher tyre speed rating than the original specifications and the fitting of an additional tyre placard indicating the minimum tyre requirements. The load rating of tyres must not be reduced from that specified by the vehicle manufacturer (for more comprehensive details on allowable tyre and rim modifications refer to Section LS *Tyres, Rims, Suspension and Steering*); and
- A collapsible steering column must be fitted.

## CHECKLIST LA3

### SUPERCHARGER AND TURBOCHARGER INSTALLATION

### CODE LA3

(N/A=Not Applicable, Y=Yes, N=No)

|          |                                                                                                                                                                                                                          |     |   |   |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|---|
| <b>1</b> | <b>ENGINE</b>                                                                                                                                                                                                            |     |   |   |
| 1.1      | Does the replacement engine comply with the requirements of Table LA1 of this Section?                                                                                                                                   | N/A | Y | N |
| 1.2      | Does the modified or replacement engine and installation comply with all relevant ADRs and/or in-service rules (i.e. smoke, gaseous emissions and noise)?                                                                | N/A | Y | N |
| 1.3      | Insert Code LT3 Approval Reference Number.....                                                                                                                                                                           | N/A |   |   |
| 1.4      | Insert Code LT4 Approval Reference Number.....                                                                                                                                                                           | N/A |   |   |
| <b>2</b> | <b>INSTALLATION</b>                                                                                                                                                                                                      |     |   |   |
| 2.1      | <b>General Requirements</b>                                                                                                                                                                                              |     |   |   |
|          | Does the replacement engine installation comply with all of the <i>General Requirements</i> of sub-sections 2.1 to 2.14 of this Section?                                                                                 |     | Y | N |
| 2.2      | <b>Strength</b>                                                                                                                                                                                                          |     |   |   |
|          | Has the engine been fitted without the alteration of the vehicle's chassis, sub-frames, cross-members or body members? If not, has the alteration been performed in accordance with Section LH <i>Body and Chassis</i> ? |     | Y | N |
|          | Has the strength of all components modified or affected by modification been verified as equivalent to the original manufacturer's specifications?                                                                       | N/A | Y | N |
|          | Are the engine mountings designed to withstand the torsional loads transmitted by the replacement or modified engine?                                                                                                    |     | Y | N |
| 2.3      | <b>Fasteners</b>                                                                                                                                                                                                         |     |   |   |
|          | Do all fasteners comply with the applicable requirements of Section LZ <i>Appendices - Appendix A Fasteners</i> ?                                                                                                        | N/A | Y | N |
| 2.4      | <b>Protection</b>                                                                                                                                                                                                        |     |   |   |
|          | Has adequate protection been provided for all hoses, electrical harnesses and rubber or plastic components?                                                                                                              |     | Y | N |
|          | Are fuel lines securely fastened and clear of high temperature components such as the exhaust system, turbocharger and air-conditioning compressor?                                                                      |     | Y | N |

[Continued overleaf]

(N/A=Not Applicable, Y=Yes, N=No)

|     |                                                                                                                                                                                                                             |     |   |   |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|---|
| 2.5 | <b>Workmanship</b>                                                                                                                                                                                                          |     |   |   |
|     | Is all work, including welding, of satisfactory quality and has all work been performed in accordance with recognised engineering standards?                                                                                |     | Y | N |
| 2.6 | <b>Diesel Engines</b>                                                                                                                                                                                                       |     |   |   |
|     | If the vehicle is fitted with a replacement diesel engine, is an engine stop control (which will prevent accidental or inadvertent starting) fitted within the engine compartment?                                          | N/A | Y | N |
|     | If the vehicle is fitted with a replacement diesel engine, is the engine able to be switched off from the ignition switch and can it only be started when the ignition switch is in the <i>Run</i> position?                | N/A | Y | N |
|     | If the vehicle has vacuum assisted brakes and a replacement diesel engine is fitted, has a vacuum pump of adequate capacity been fitted to ensure the braking system continues to comply with the ADR braking requirements? | N/A | Y | N |
| 3   | <b>SAFETY UPGRADE</b>                                                                                                                                                                                                       |     |   |   |
| 3.1 | If power has increased by more than 20%, has the vehicle been upgraded to comply with specific requirements outlined above in Code LA3?                                                                                     | N/A | Y | N |
| 3.2 | For vehicles with a modified braking system, has the design been certified to the requirements of Code LG1?<br><br>Insert Code LG1 Approval Reference Number .....                                                          | N/A | Y | N |
| 3.3 | For vehicles with a modified braking system, have the completed modifications been certified to the requirements of Code LG2?                                                                                               | N/A | Y | N |
| 3.4 | Are all additional checklists for modifications not covered by Section LA completed and attached?                                                                                                                           | N/A | Y | N |

**Note:** If the answer to any question is **N (No)**, the modification cannot be certified under Code LA3.

[Continued overleaf]

| ENGINE DETAILS                |  |                       |  |
|-------------------------------|--|-----------------------|--|
| Make                          |  | Type                  |  |
| Number of Cylinders or Rotors |  | Displacement (Litres) |  |
| Maximum Power Output (kW)     |  | Engine Mass (kg)      |  |

| CERTIFICATION DETAILS                 |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
|---------------------------------------|--|--|--|--|--|-------|--|--|--|--|--|---------------------|--|--|--|--|--|
| Make                                  |  |  |  |  |  | Model |  |  |  |  |  | Year of Manufacture |  |  |  |  |  |
| VIN                                   |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Chassis Number (If applicable)        |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Brief Description of Modification/s   |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Vehicle Modified By                   |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Certificate Number (If applicable)    |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Vehicle Certified By ( <i>Print</i> ) |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Signatory's Employer (If applicable)  |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Signatory's Signature                 |  |  |  |  |  |       |  |  |  |  |  | Date                |  |  |  |  |  |

## ENGINE MODIFICATIONS

### CODE LA4

#### SCOPE

Modifications covered under this code include the fitting of equipment or modified components to the original engine (or manufacturer's option) for that vehicle model and the fitting of equipment or modified components to a non-original engine for that vehicle model.

**Code LA4 does not apply to ADR category L-Group vehicles and motorcycles.**

#### MODIFICATIONS COVERED UNDER CODE LA4

The following modifications may be performed under Code LA4:

- Fitting of equipment or modified components to the original engine (or manufacturer's option) for that vehicle model; and
- Fitting of equipment or modified components to a non-original engine.

#### MODIFICATIONS NOT COVERED UNDER CODE LA4

The following is a summary of the modifications that may not be performed under Code LA4:

- Fitting replacement modified performance engines (these are covered by Code LA2); and
- Fitting of a turbocharger or supercharger (these are covered by Code LA3).

#### COMPLIANCE WITH APPLICABLE VEHICLE STANDARDS

Modified vehicles must continue to comply with the ADRs to which they were originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

*Compliance with the AVSR* also means compliance with the equivalent regulations of a State or Territory of Australia.

Outlined below in Table LA10 are areas of the vehicle that may be affected by the modifications and that may require re-certification, testing and/or data to show compliance for the modified vehicle. This is not an exhaustive list and other modifications may also affect ADR compliance.

**Table LA10 Summary of items that if modified or altered, may detrimentally affect compliance with applicable ADRs**

| DETAIL                         | REQUIREMENTS                                                             |
|--------------------------------|--------------------------------------------------------------------------|
| Gaseous Emissions              | ADR 27x, 30, 30/..., 36x, 36/..., 37, 37/..., 40, 70/..., 79/..., 80/... |
| External Noise                 | ADR 28x, 28/..., 83/...                                                  |
| Brake System (vacuum recharge) | ADR 31, 31/..., 35x, 35/...                                              |
| Exhaust Outlets                | ADR 42/...                                                               |
| Ground Clearance               | ADR 43/...                                                               |

To determine the ADRs that apply to the vehicle in question, refer to the applicability tables in Section LO. Vehicles manufactured on or after 1 January 1969 and prior to 1 July 1988 need to comply with the Second Edition ADRs while vehicles manufactured after this date need to comply with the Third Edition ADRs. Section LO has separate applicability tables for each edition.

Alternatively, ADR applicability tables for individual vehicle categories may be referenced on the Department of Infrastructure and Transport *RVCS* website at the following address and under the section titled *ADR Applicability Tables*:

**<http://rvcs.dotars.gov.au/>**

The ADRs apply according to the vehicle's category and date of manufacture. It is the responsibility of the signatory to refer to the appropriate ADR applicable to the vehicle.

## **SPECIFIC REQUIREMENTS**

The following requirements apply to engine modifications.

Engine modifications such as changes to engine management systems, camshafts and induction systems have the capacity to substantially increase a vehicle's power and performance and are generally considered on the same basis as a performance engine conversion with a safety upgrade required.

### **1 ENGINE MODIFICATIONS**

When ADR complying engines are modified by using alternative components such as camshafts, carburettors and engine management systems, proof of compliance with any relevant emission ADR is required (refer to Code LT3 *Gaseous Emissions Test* in Section LT *Test Procedures*).

### **2 MODIFIED EXHAUST SYSTEMS**

When exhaust systems are modified, proof of compliance with the relevant ADR or in-service AVSR is required (refer Code LT4 - *Noise Emissions Test* in Section LT *Test Procedures*).

### **3 MANDATORY SAFETY EQUIPMENT UPGRADES FOR PRE-ADR VEHICLES**

The following vehicle safety systems must be upgraded in order to provide for the increase in vehicle performance if the modifications result in an increase of power output in excess of 20% more than the original most powerful engine option. These are the minimum standards required, but where any ADR applies, the ADR takes precedence:

- Seat belts must be installed for all seating positions (all outboard seating positions require retractor type lap/sash seatbelts and inboard seating positions either lap/sash or lap belts (refer Section LK *Occupant Protection*));
- Split or dual braking system - a dual system offers a greater degree of safety in the event of partial braking system failures. Fluid loss in one part of the system still allows the non-affected circuit to stop the vehicle, albeit with a longer braking distance (refer to Section LG *Brakes*);
- Windscreen washers must be fitted;
- Two speed windscreen wipers with a fast speed of at least 45 cycles per minute (cpm) and a slow speed of at least 20 cpm must be fitted (single speed wipers are acceptable if the speed is 45 cpm or more);
- A windscreen demister must be fitted;
- A flat or convex external rear vision mirror complying with the latest version of ADR14 must be fitted to the driver's side of the vehicle;
- If there is no effective internal rear vision mirror, a passenger's side external mirror must be fitted;
- Flashing direction indicator lights must be fitted at the front and rear of the vehicle;
- To ensure safe operation of a vehicle the signatory may specify a higher tyre speed rating than the original specifications and the fitting of an additional tyre placard indicating the minimum tyre requirements. The load rating of tyres must not be reduced from that specified by the vehicle manufacturer. For more comprehensive details on allowable tyre and rim modifications refer to Section LS Tyres, Rims, Suspension and Steering; and
- A collapsible steering column must be fitted.

## CHECKLIST LA4 ENGINE MODIFICATIONS

### CODE LA4

(N/A=Not Applicable, Y=Yes, N=No)

|          |                                                                                                                                                                                                                          |     |   |   |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|---|
| <b>1</b> | <b>ENGINE</b>                                                                                                                                                                                                            |     |   |   |
| 1.1      | Is the engine the original engine or a manufacturer's option for that model?                                                                                                                                             |     | Y | N |
| 1.2      | Does the engine and installation comply with all relevant ADRs and/or in-service rules (i.e. smoke gaseous emissions and noise)?                                                                                         | N/A | Y | N |
| 1.3      | Insert LT3 Approval Reference Number.....                                                                                                                                                                                | N/A |   |   |
| 1.4      | Insert LT4 Approval Reference Number.....                                                                                                                                                                                | N/A |   |   |
| <b>2</b> | <b>INSTALLATION</b>                                                                                                                                                                                                      |     |   |   |
| 2.1      | <b>General Requirements</b>                                                                                                                                                                                              |     |   |   |
|          | Does the engine installation continue to comply with all of the <i>General Requirements</i> of sub-sections 2.1 to 2.14 of this Section?                                                                                 |     | Y | N |
| 2.2      | <b>Strength</b>                                                                                                                                                                                                          |     |   |   |
|          | Has the engine been fitted without the alteration of the vehicle's chassis, sub-frames, cross-members or body members? If not, has the alteration been performed in accordance with Section LH <i>Body and Chassis</i> ? | N/A | Y | N |
|          | Has the strength of all components modified or affected by the modifications been verified as equivalent to the original manufacturer's specifications?                                                                  | N/A | Y | N |
|          | Are the engine mountings designed to withstand the torsional loads transmitted by the modified engine?                                                                                                                   |     | Y | N |
| 2.3      | <b>Fasteners</b>                                                                                                                                                                                                         |     |   |   |
|          | Do all fasteners comply with the applicable requirements of Section LZ <i>Appendices - Appendix A Fasteners</i> ?                                                                                                        | N/A | Y | N |
| 2.4      | <b>Protection</b>                                                                                                                                                                                                        |     |   |   |
|          | Has adequate protection been provided for all hoses, electrical harnesses and rubber or plastic components?                                                                                                              |     | Y | N |
|          | Are fuel lines securely fastened and clear of high temperature components such as the exhaust system, turbocharger and air conditioning compressor?                                                                      |     | Y | N |

[Continued overleaf]

(N/A=Not Applicable, Y=Yes, N=No)

|          |                                                                                                                                                                 |     |   |   |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|---|
| 2.5      | <b>Workmanship</b>                                                                                                                                              |     |   |   |
|          | Is all work, including welding, of satisfactory quality and has all work been performed in accordance with recognised engineering standards?                    |     | Y | N |
| <b>3</b> | <b>SAFETY UPGRADE</b>                                                                                                                                           |     |   |   |
| 3.1      | If power has increased by more than 20%, has the vehicle been upgraded to comply with specific requirements outlined above in Code LA4?                         | N/A | Y | N |
| 3.2      | For vehicles with a modified braking system, has the vehicle been certified to the requirements of Code LG1?<br>Insert Code LG1 Approval Reference Number ..... | N/A | Y | N |
| 3.3      | Have completed braking system modifications been certified to Code LG2?                                                                                         | N/A | Y | N |
| 3.4      | Are all additional checklists for modifications not covered by Section LA completed and attached?                                                               | N/A | Y | N |
| 3.5      | Does the completed vehicle continue to comply with all applicable ADRs?                                                                                         | N/A | Y | N |

**Note:** If the answer to any question is **N (No)**, the modification cannot be certified under Code LA4.

| ENGINE DETAILS                |  |                       |  |
|-------------------------------|--|-----------------------|--|
| Make                          |  | Type                  |  |
| Number of Cylinders or Rotors |  | Displacement (Litres) |  |
| Maximum Power Output (kW)     |  | Engine Mass (kg)      |  |

| CERTIFICATION DETAILS                   |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
|-----------------------------------------|--|--|--|--|--|-------|--|--|--|--|--|---------------------|--|--|--|--|--|
| Make                                    |  |  |  |  |  | Model |  |  |  |  |  | Year of Manufacture |  |  |  |  |  |
| VIN                                     |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Chassis Number<br>(If applicable)       |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Brief Description of<br>Modification/s  |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Vehicle Modified By                     |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Certificate Number<br>(If applicable)   |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Vehicle Certified By ( <i>Print</i> )   |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Signatory's Employer<br>(If applicable) |  |  |  |  |  |       |  |  |  |  |  |                     |  |  |  |  |  |
| Signatory's Signature                   |  |  |  |  |  |       |  |  |  |  |  | Date                |  |  |  |  |  |