

Vehicle Standards Bulletin 14

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

**SECTION LL
MOTORCYCLES & THREE WHEELED
VEHICLES**

1st February 2006

National Code of Practice for Light Vehicle Construction and Modification (NCOP)

Warning to Users

Users of the NCOP 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 these requirements, or if more information is needed for any other issues or processes, users should contact their relevant registration authority **prior** to commencing any work.*

Whilst the NCOP provides assistance with respect to the construction of 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 the NCOP also need to ensure that they refer to the most recent version of the relevant Section/s when working on a job or project. The version is identified by the date on the face page of each Section. On the website, each Section has the version date contained in the Section file name for easy identification.

It is prudent to check for new versions if a job or project is taking a long time to complete.

If they have not already done so, users must also download the Preface and Introduction.

These two Sections provide the necessary background information to assist users in understanding how the NCOP is administered by registration authorities across Australia, on how it is structured, and the meaning of the types of modification codes specified in the NCOP.

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

*Many of the Sections refer to other Sections for further information or additional requirements. Users **must** download all relevant Sections. Lack of information due to insufficient downloads will not be accepted as an excuse by authorities.*

If in doubt about any issue concerning or contained in the NCOP, users should seek clarification from the appropriate state or territory registration authority.

Please do not contact the Department of Transport and Regional Services (DOTARS) about the NCOP. DOTARS provides the central NCOP website as a service only.

CONTENTS

		Page
1	Scope	4
2	General Requirements	4
	2.1 Design	4
	2.2 Fabrication	12
3	Australian Design Rules	14
4	Non-certified Modifications	14
5	Certified Modifications (LL Approval Codes)	15
	LL1 to LL6 Not currently in use	
	LL7 Seating Capacity Alteration	16
	Checklist	18

1 SCOPE

This Section outlines the minimum design, installation and fabrication requirements for the following modifications involving motorcycles and other “L” Group vehicles.

The alterations must not affect the safe handling of the motorcycle or endanger either the rider or any other road user. In addition, the motorcycle must not be altered in any way such that it will create a nuisance either to other road users or to any member of the public.

NON-CERTIFIED MODIFICATIONS

Fitting a manufacturer’s optional component such as an engine, transmission, exhaust system or fuel tank for the particular make/model of the vehicle in question. (Note that replacing parts or components of a motorcycle with the manufacturer’s parts or equivalent components does not fall into the category of “modifications” and as a consequence no approvals are necessary for repair work).

NOTE: The main design installation and fabrication requirements for all of the above modifications are contained in sub-section 2 *General Requirements*.

CERTIFIED MODIFICATIONS

Approvals are **allowed** under Code LL7 for:

- Conversion of a two-seat motorcycle to a single seater.
- Conversion of a modified motorcycle to original seating configuration.

2 GENERAL REQUIREMENTS

This sub-section applies to all motorcycles and should be read in conjunction with the other sub-sections of the LL Code and the specific Approval Code for the modification or conversion.

2.1 DESIGN

DIMENSIONAL REQUIREMENTS - MOTORCYCLES WITHOUT SIDECAR

The maximum width including the load and equipment must not exceed 1 metre.

The load or equipment must not project more than 150mm beyond the extreme outer portion of the motorcycle on either side.

The maximum longitudinal projection beyond the outer extremity of the tyres of any part of the motorcycle and loading or equipment thereon must **not** exceed 150mm in the case of the front tyre and 300mm in the case of the rear tyre.

If the motorcycle is fitted with a “sissy” bar it must not extend above the rider’s head and should not have any sharp points or edges.

GROUND CLEARANCE

When laden, the ground clearance shall not be less than a 100mm measured from a horizontal road surface to any point on the underside of the motorcycle or sidecar excluding tyres wheels and hubs.

SPRUNG SEAT

Motorcycles without rear suspension (i.e. a “hard tail”) must have a sprung seat for the rider and, where a pillion seat is fitted, it must also be sprung.

BRAKES

Service Brake System

The vehicle must be equipped with either a ‘Split Service Brake System’ or independently actuated service brake systems. Vehicles that have independently actuated service brake systems must have 2 independent brake systems, one capable of acting on the front wheel and the other on the rear wheel(s).

Failure of any component in a mechanical service brake system must not result in a loss of braking ability in the other service brake system.

A leakage type failure in a hydraulic service brake system must not result in a loss of braking ability in the other service brake system. Each vehicle equipped with a ‘Hydraulic Brake System’ must meet the reservoir capacity requirements of ADR 33/00.

The service brake system must be installed so that the lining thickness of drum brake shoes may be visually inspected, either directly or by the use of a mirror without removing the drums, and so that disc brake friction lining thickness may be visually inspected without removing the pads.

The ‘Controls’ by which brakes are actuated must be located so that they are readily accessible to the driver in the normal driving position.

SIDECARS

Sidecars must only be fitted to the left hand side of a motorcycle.

When a sidecar or side-box is attached to a motorcycle manufactured after February 1976, a mechanical parking brake must be fitted.

The maximum width of the combination, including any load and equipment, must not exceed 1.85m.

Any load or equipment must not project more than 150mm beyond the extreme outer portion of the vehicle on either side.

The overhang of any load or equipment forward of the front tyre must not exceed 600mm. The overhang of any load or equipment rearward of the rear tyre must not exceed 900mm.

STAND

Any stand fitted to a motorcycle shall be maintained in an efficient and safe condition and must be equipped with a spring or other device capable of holding it securely in the “up” position at all times when the stand is not in use.

FOOTRESTS

Every motorcycle must be fitted with adequate footrests for the rider and pillion passenger (if a seat is provided for the pillion passenger).

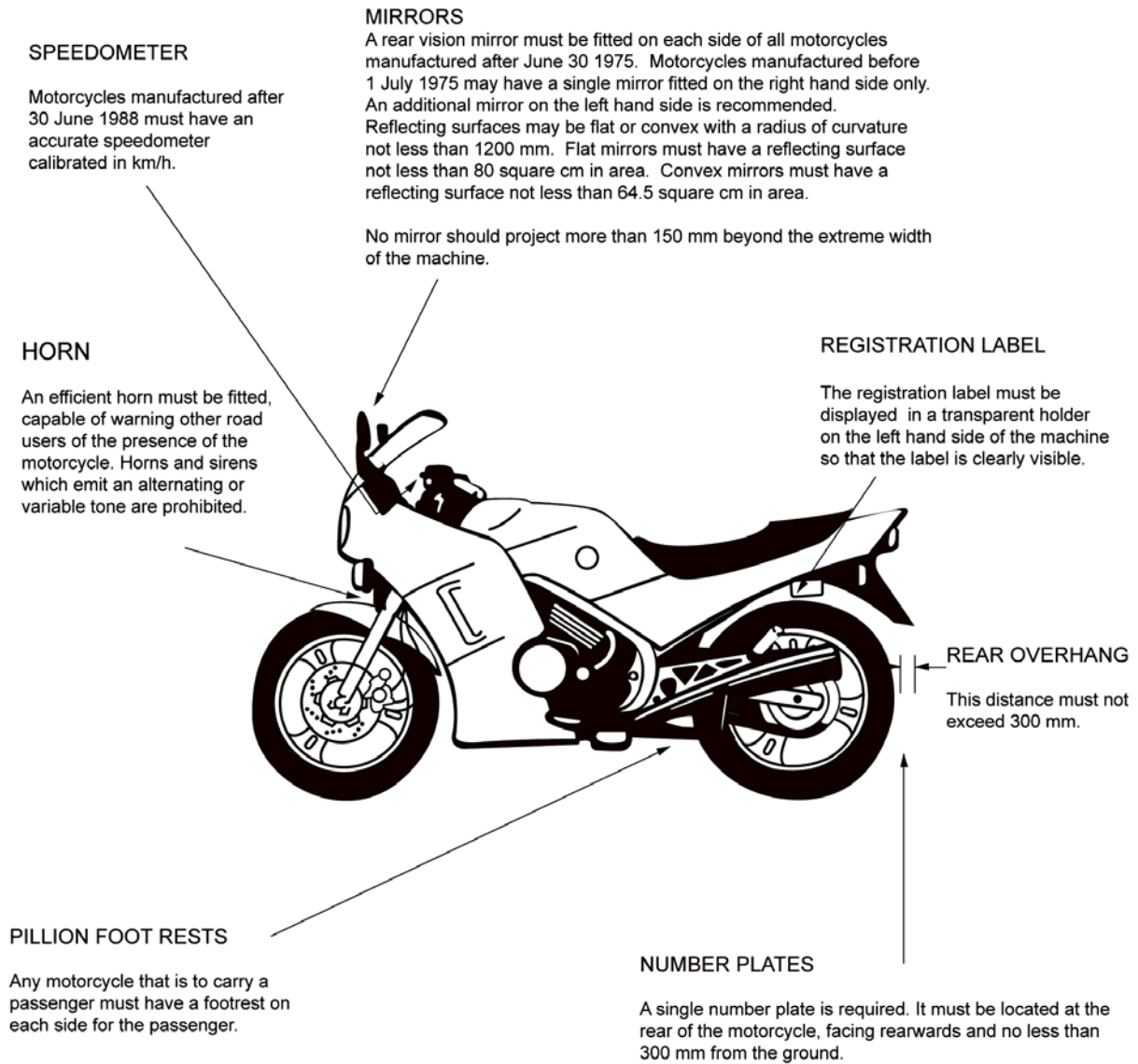


Figure 1. Additional requirements for motorcycles

REAR VISION MIRRORS

A motorcycle must be equipped with two rear vision mirrors symmetrically placed relative to the centre of the handlebars. The mirrors must be large enough to reflect to the rider, a clear view of the road behind and of any following or overtaking vehicle. For flat mirrors the reflective surface area shall not be less than 80 square centimetres and for convex mirrors the reflective surface area not less than 64.5 square centimetres.

If a mirror has a convex surface it shall have a radius of curvature not less than 1200mm.

MUDGUARDS

Mudguards must be fitted to all wheels (including side-car wheels). Each mudguard must be at least as wide, over its entire length, as its respective wheel and tyre.

A front wheel mudguard must cover the rearward section of the wheel through the area between two lines, one vertical and the other horizontal, both drawn through the centre of the wheel. If suitable protection is afforded by the frame or construction of the motorcycle, the front mudguard need only cover the area that is unprotected.

A rear wheel or side-car wheel mudguard must extend at least from a point vertically above the front of the tyre to a point vertically above the rear of the tyre.

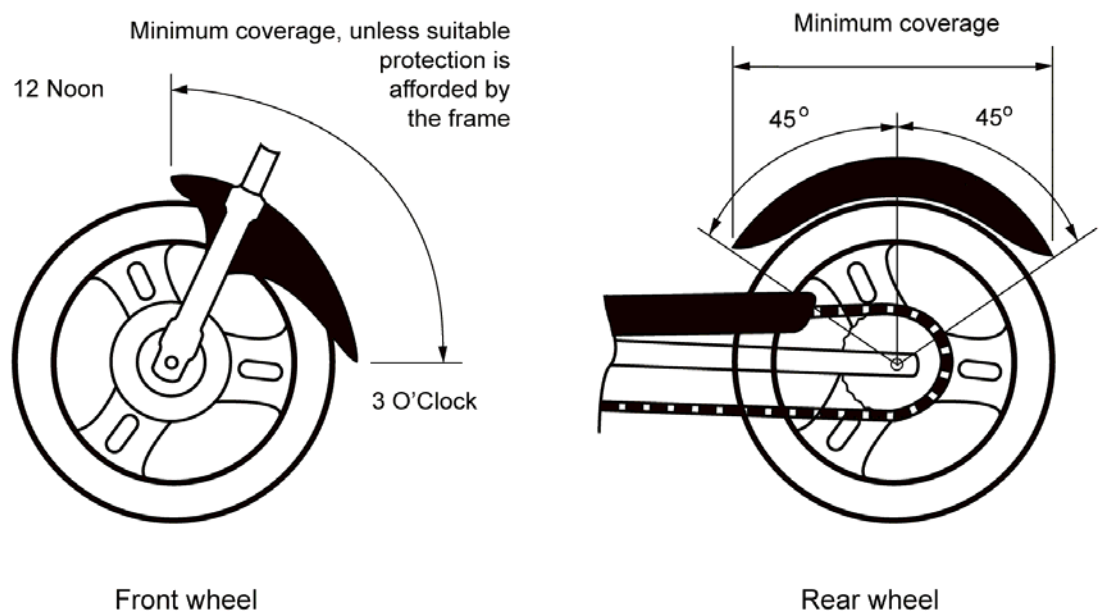


Figure 2 Mudguard dimensions

FOOT AND HAND CONTROLS

The controls for motorcycles are standardised, therefore the position and operation of foot and hand controls must be kept, as far as practicable, to the manufacturer's original specification. For example, if the rider's footrests are moved rearwards (that is, converted to "rear sets") it is not permissible to reverse or invert the gear lever. For safety reasons, the only acceptable method for this conversion is to fit a linkage, which keeps the gear change pattern the same as the original. Riders should always be able to operate the brake pedal without lifting their foot from the footrest.

CHAIN GUARDS

If the motorcycle is chain driven and the construction of the frame is not sufficient to protect the rider and/or the pillion passenger from the driving sprocket and the upper run of the chain, the motorcycle must be fitted with a chain guard. The guard must extend at least 300mm rearward of the rearmost footrest or to the vertical centre of the rear sprocket whichever is the lesser.

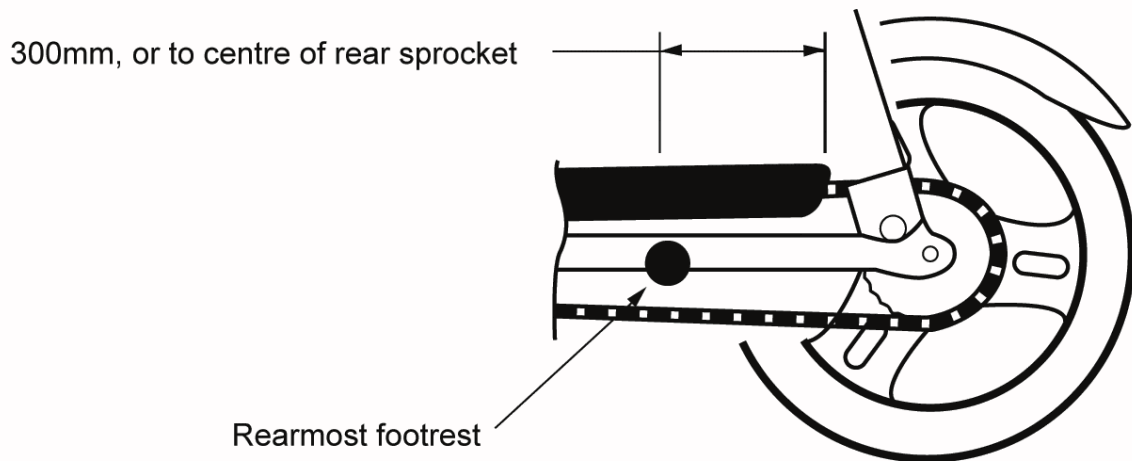


Figure 3. Chain guard dimensions

FRAME OR SUSPENSION MODIFICATIONS

Motorcycle design is a complex task. Modifications made to a motorcycle's frame or suspension, can adversely affect the structural integrity of the frame, steering head, front forks and suspension increasing the risk of component failure. Similarly, braking and wheel loading may be adversely affected.

Motorcycles with custom frames, extended forks or structural modifications require an engineering report.

When forks are extended, without modifications to the frame, care must be taken to ensure the vehicle continues to comply with ADR 57 with respect to special requirements for L group vehicles.

A motorcycle with a specially designed and constructed frame will be considered to be an *Individually Constructed Vehicle*.

Note: Section LO provides information on the construction of ICVs for:

- Motorcycles ADR category LA, LB, LC and LD, and
- Guidelines together with checklists for LEM1 and LEP1, ADR Category Tricycles.

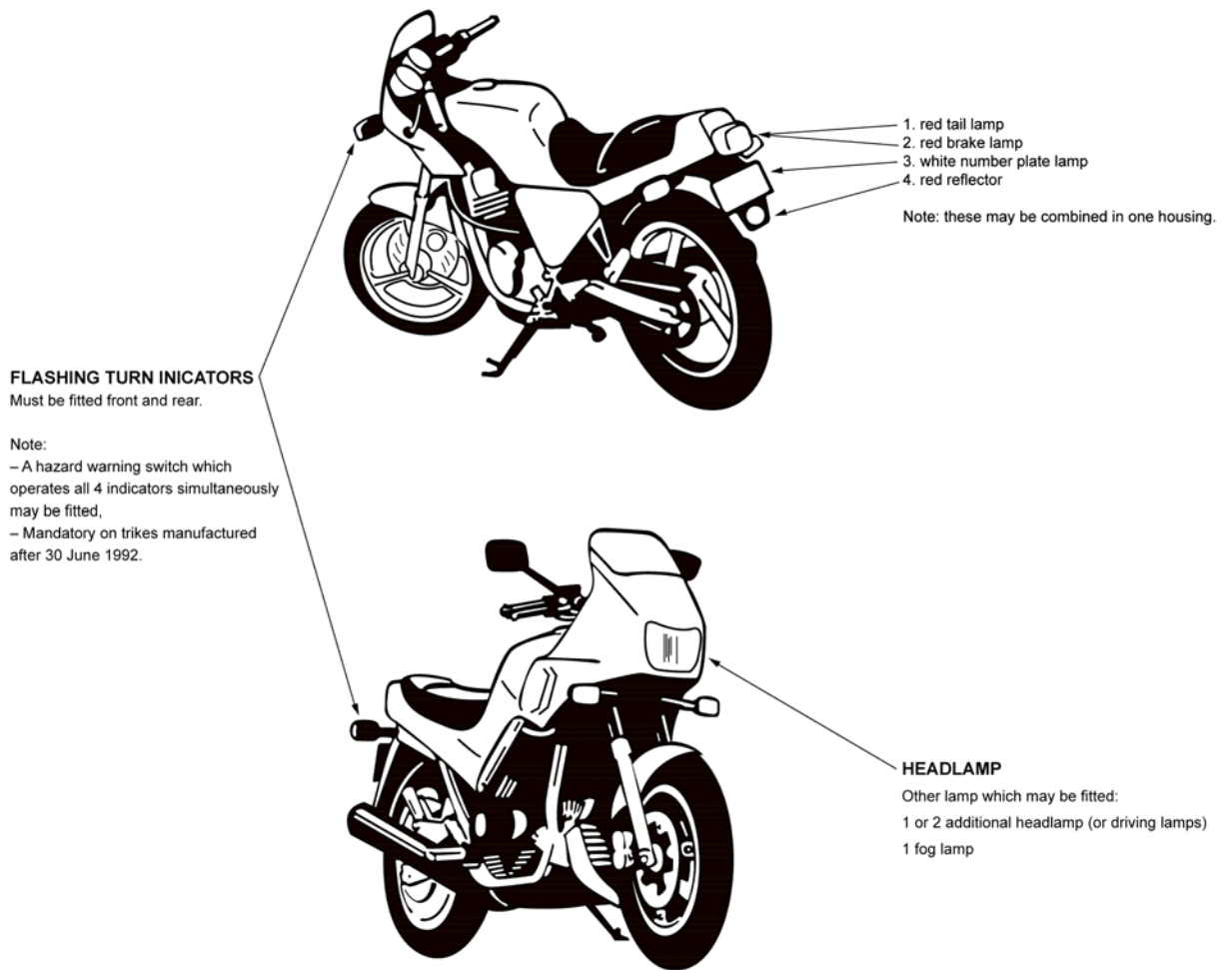


Figure 4. Lighting requirements for motorcycles

HANDLEBARS

Handlebar dimensions have to be limited to ensure that the rider has adequate control over the motorcycle at all times.

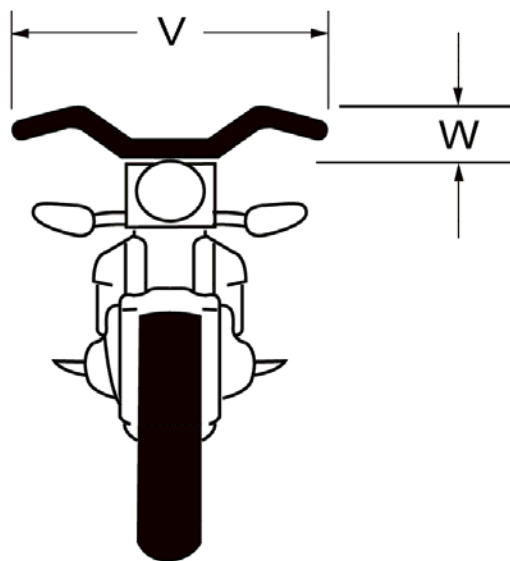
Motorcycles manufactured before 1 July 1988 (Figure 5):

The handlebar must have the same shape and be of the same length on either side of the front wheel and steering head assembly.

The distance between the extreme ends of the handlebar (V) must not be less than 550 mm.

The highest point on the handlebar must not be more than 380 mm (W) above the top of the steering yoke.

Where the highest point of the handlebar is more than 205 mm vertically above the top of the steering yoke (W), the distance between the extreme ends of the handle bar (V) must not be less than 660 mm.



Dimension "V" not less than 550mm and not more than 900 mm".

Dimension "W" not greater than 380mm.

Note: If "W" is greater than 205mm then "V" must not be less than 660mm.

DO NOT FIT HANDLEBARS THAT ARE OUTSIDE THESE LIMITS

Figure 5. Motorcycles manufactured before 1 July 1988

Motorcycles manufactured after 30 June 1988 (Figure 7)

The handlebar must have the same shape and be of same length on either side of the front wheel and steering head assembly.

The distance between the extreme ends of the handlebar (X) must not be less than 500 mm and not more than 900 mm.

The height of the lowest part of the handgrip must not be more than 380 mm above the lowest part of the upper surface of the rider's seat (Y).

The horizontal distance between the mid-point of the steering yoke bearing and a point vertically above the centre of the front wheel must not exceed 550 mm.

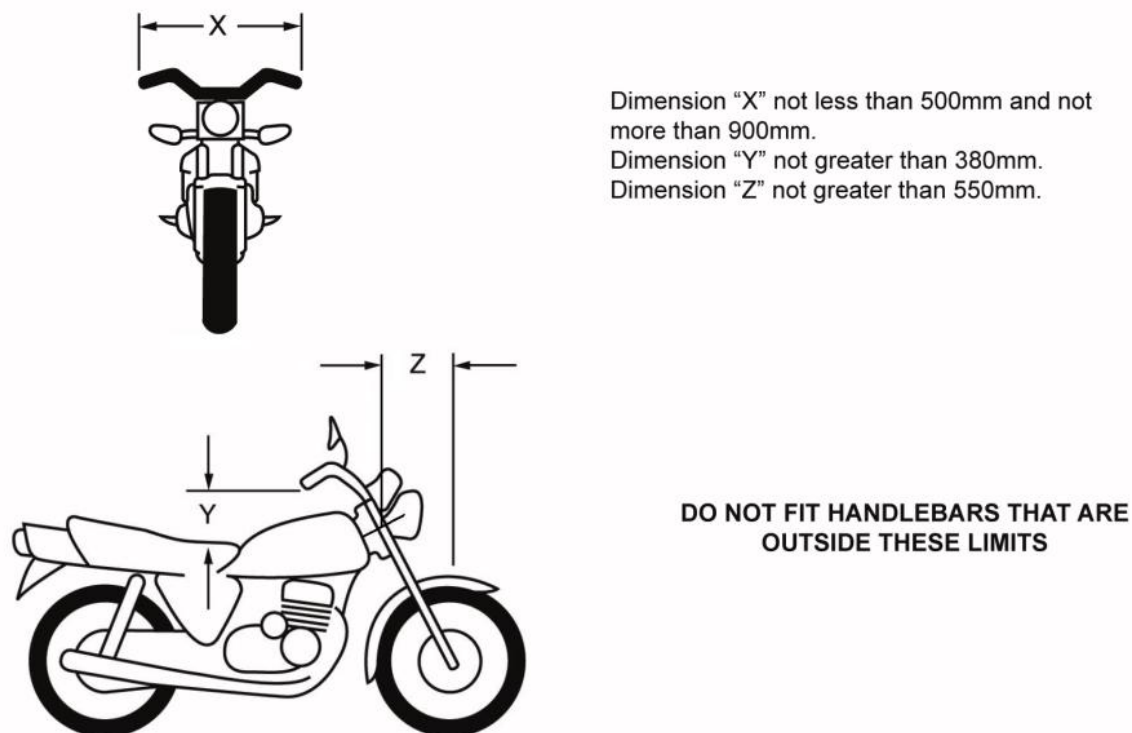


Figure 6: Motorcycles manufactured after 30 June 1988.

TYRES AND RIMS

Each tyre and rim must be strong enough to support the machine when it is fully loaded. For more detailed information about this subject refer to Section LS.

NOISE

Motorcycles manufactured from 1 July 1975, are subject to strict design requirements for noise emissions. Components affecting noise emissions (especially exhaust systems) must not be modified and must be maintained in a serviceable condition. Any replacement component must be as near as practical to the original component specification.

The AVSR sets stationary noise limits for all motor vehicles including motorcycles. The stationary noise level for motorcycles or motor trike, built after February 1985, is 94dB(A) or for any other motorcycles or motor trikes, 100dB(A).

Exhaust system should therefore not be replaced or modified if this is likely to increase the vehicle's noise output beyond that of the unmodified system when in good condition.

Motorcycles manufactured from 1 July 1988 have all components of the Silencing System marked with the name or trade name of the manufacturer. Every motorcycle manufactured after 1 July 1988 carries details of the ADRs 39/...and 83/.. stationary noise test in the following format:

<p>STATIONARY NOISE TEST INFORMATION Tested atdB(A) atr/min Silencing System: (manufacturer's name) Identification: (silencer trade description)</p>
--

Any replacement part of the system must show the trademark or the name of the original manufacturer of the system.

2.2 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.

FASTENERS

All fasteners in highly stressed locations must be high tensile ISO Grade 8.8 (mm sizes), SAE Grade 5 (inch sizes) or equivalent as a minimum specification. All other fasteners are to be at least of similar strength and number to those in the original installation. Self-locking nuts should be used in preference to spring washers. Locking nuts with plastic inserts ("Nyloc") must not be used in high temperature applications such as brake calliper mountings.

HEATING, WELDING OR ELECTROPLATING OF STEERING AND SUSPENSION COMPONENTS

The heating or welding of steering or suspension components will only be accepted if the modification in question is accompanied by a satisfactory report from a Signatory or Metallurgist*. The report must confirm that the modified parts are at least as strong as the original and contain no latent defects. Every modified part must be given a unique permanent identity number, which must be recorded by the modifier.

In the accompanying report, it would be expected that the following issues would be considered and commented on:

- Material specifications of the component to be modified.
- A specification of weld material and compatibility with the parent material if welding is involved.
- Description and/or diagrams of the preparation of the component if welding is involved.
- Details of preheating if required prior to the modification.
- Details of heat treatment procedure after modification.
- Hardness testing before and after modification of the modified zone.
- Results of non destructive testing

Note: Welding must be conducted in accordance with Australian Standard 1554 *Part 1 Welding of Steel Structures*.

For multiple component modifications it is permissible to replace the Signatory's report with a *Letter of Conformity* providing that the components being modified or manufactured are all to an

identical specification. The *Letter of Conformity* must make reference to the Signatory's report that provided the initial approval for the work in question. Jurisdictions may also request evidence of procedures and practices that ensures conformity of production.

- * The Signatory or Metallurgist specified in this section must be appropriately qualified in the assessment of welded or heat-treated metal components.

CHROME PLATING

Critical steering and suspension components are not to be chrome plated.

{Advisory Note:

An unfortunate side effect of chrome plating in some instances is a phenomenon known as "hydrogen embrittlement". The hydrogen produced as a result of the plating process causes weak spots in the base metal and is undetectable as embrittlement occurs under the surface of the chrome plating.

The process of embrittlement can develop into cracks that result in components failing catastrophically under relatively low forces.

Hydrogen embrittlement is more likely to occur if:

- The component is made of high grade alloy, is cast or is heat treated.
- The component is subject to reversing stresses.

Failure of a component through hydrogen embrittlement can be catastrophic and failures can occur without warning. This is compounded by the fact that chrome plating may hide other defects. A component may appear to be in good order without visible cracks on the surface, but can fracture easily from a shock load such as driving over a pothole.

Hydrogen Embrittlement Minimisation by Baking

Certain alloys can have the effects of hydrogen embrittlement reduced by "embrittlement relief baking". This procedure, if carried out within 24 hours of plating, may result in the dissipation of the hydrogen atoms and hence reduce the likelihood of embrittlement. The baking process may however, in certain circumstances, cause a reduction in the physical properties of the parent material.

In order to maintain a high order of certainty as to the strength of critical components jurisdictions will not accept "relief baked" components unless:

The components are both plated and then baked in a prescribed manner that ensures a high level of conformity of production. The processes thus carried out must be supported by physical test data that confirms the material strength of the finished part is adequate for the function of the part in question. A report must accompany the finished part that is signed by a Signatory or Metallurgist who is appropriately qualified in the assessment of welded or heat-treated metal components. The report must confirm that conformity of production processes were used in the plating and baking process and that the necessary physical testing was carried out to confirm the strength of the final product.}

3 AUSTRALIAN DESIGN RULES

The ADRs that may be affected by modifications to motorcycles are covered in this section as follows:

ADR 7	Hydraulic Brake Hoses
ADR 28	Motor Vehicle Noise
ADR 33	Motorcycle Braking Systems
ADR 39	Motorcycle Noise
ADR 42	General Safety Requirements

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

The vehicle must continue to comply with all ADRs applicable at the date of its manufacture.

4 NON-CERTIFIED MODIFICATIONS

The following modifications may be carried out provided they do not affect compliance with Australian Design Rules and provided they meet the following general safety requirements.

4.1 OPTIONAL COMPONENTS OFFERED BY THE MANUFACTURER

- Engine
- Transmission
- Front and Rear Suspensions
- Exhaust
- Fuel tank

5 CERTIFIED MODIFICATIONS (LL CODES)

This section specifies particular requirements and covers limitations on approvals carried out under individual LL Approval Codes. Some modifications however are covered by other sections of the NCOP and these are tabulated below. These modifications must be accompanied by the appropriate approval code as specified in the relevant Section of the NCOP.

Modification	NCOP Section
Tyres and Rims	Refer to Section LS
Fuel tank	Refer to Section LM

Each Code is supplemented with a checklist.

LL APPROVAL CODE DIRECTORY

Code	Name	Page
LL7	Seating Capacity Alteration	17
LL7	Checklist	19

SEATING CAPACITY ALTERATION

APPROVAL CODE LL7

SCOPE

The following is a summary of the designs that may be approved under Code LL7 – Seating Capacity Alteration:

Approvals are **allowed** under Code LL7 for:

- Conversion of a two seat motorcycle to a single seater.
- Conversion of a modified motorcycle to original seating configuration.

Approvals are **not allowed** under Code LL7 for:

- Conversion of a single seat motorcycle to a two seater where that model motorcycle was only manufactured as a single seater.
- Construction of an ICV motorcycle or tricycle. (These vehicles are covered in Section LO).

ADRS, ACTS AND REGULATIONS

The modified vehicle must continue to comply with all applicable ADR's, Acts and Regulations.

Outlined below 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.

DETAIL	REQUIREMENTS
Special Requirements for L Group Vehicles	ADR 57

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

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 are specific requirements to enable approvals to be issued for seating capacity alterations under Approval Code LL7.

The approval must also comply with the general guidelines contained in sub-section 2 *General Requirements*.

1 TWO SEATER TO SINGLE SEATER

For a two seater motorcycle to be converted to a single seater, it is necessary to shorten the seat and remove the pillion foot pegs/mounting brackets. For a motorcycle to be classified as a single seater, it is necessary for the motorcycle to be fitted with only:

- one seat which has a length less than 500 mm; and
- one pair of foot pegs and mountings.

2 REDUCTION IN SEAT LENGTH

Only the upholstered section of the seat needs to be shortened.

The maximum length of the upholstered section of the seat is 500 mm.

The seat support frame and mountings should not normally be modified.

The shortened seat must have no sharp edges or protrusions.

Any equipment or fittings exposed by the seat modifications must be protected if likely to cause injury.

3. REMOVAL OF FOOT PEGS AND MOUNTING BRACKETS

The foot pegs must be removed by cutting the mounting brackets flush with the frame.

When foot pegs are mounted in threaded holes, the attaching holes must be enlarged to remove all traces of thread.

No sharp edges or damage to the frame/trailing arms is permitted.

No oxy-cutting or application of heat is permitted for these modifications.

1. SINGLE TO TWO SEATER

When converting a motorcycle (which has been previously modified to a single seater) back to a two seater, it should be restored as close as possible to original manufacturer's specification.

2. INCREASE IN SEAT LENGTH

- The seat must be returned to original manufacturer's specification or equivalent.
- The seat support frame and mountings should not normally be modified.
- The lengthened seat must have no sharp edges or protrusions.

Any equipment or fittings exposed by the seat modifications must be protected if likely to cause injury.

3. FITTING OF FOOT PEGS AND MOUNTING BRACKETS

Pillion passenger foot pegs must be fitted as close to the manufacturer's original position as possible.

- The foot pegs are to be mounted in accordance with good automotive practice.
- No sharp edges, weakening of, or damage to the frame/trailing arms is permitted.
 - No oxy-cutting or application of heat is permitted for these modifications.

CHECKLIST
SEATING CAPACITY ALTERATION
APPROVAL CODE LL7

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

1	TWO SEATER TWO SEATER TO SINGLE SEATER			
1.1	Is the upholstered section of the seat less than 500mm long?	N/A	Y	N
1.2	Is the modified portion of the motorcycle free of sharp edges, protrusions or fittings likely to cause injury?	N/A	Y	N
1.3	Have the foot pegs been removed and mounting brackets cut off or threaded holes enlarged?	N/A	Y	N
2	SINGLE SEATER TO TWO SEATER			
2.1	Has the seat been returned to original manufacturer's specification or equivalent?	N/A	Y	N
2.2	Is the modified portion of the motorcycle free of sharp edges, protrusions or fittings likely to cause injury?	N/A	Y	N
2.3	Are pillion passenger foot pegs installed in the original, or as close as possible to the original position and in accordance with good automotive practice?	N/A	Y	N
3	GENERAL			
3.1	Does the frame remain undamaged after modification?		Y	N
3.2	Is the quality of workmanship of a satisfactory standard?		Y	N

NOTE: If the answer to any question is **N (No)**, the alteration cannot be approved under Approval Code LL7.

MakeModelYear of Manufacture

Frame No. or VIN

Vehicle Modified by.....

Date of Inspection.....

Company (if applicable).....

Signed.....Date.....