

# Queensland Code of Practice: Vehicle Modifications (QCOP)

Code LL1: Modifications to Motorcycle to convert into Motor Tricycle (LC category to LEM1 category)

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# CODE LL1

## Modifications to Motorcycle to convert into Motor Tricycle (LC category to LEM1 category)

### 1.0 Scope

The LL1 modification code specifies requirements for certifying modifications to a motorcycle (LC category) to convert it into a motor tricycle of (LEM1 category).

For this code, the standard definitions of the Australian Design Rule (ADR) categories LC and LEM1 apply.

Motorcycle (LC) - a 2-wheeled motor vehicle with an engine cylinder capacity exceeding 50 ml or a 'Maximum Motorcycle Speed' exceeding 50 km/h.

Three wheeled L group vehicle (LEM1) - the driver's 'Seat' is of a saddle type and one wheel at the front, two at rear.

This code covers modifications to a motorcycle, so typically a standard production kit can be fitted to a motorcycle to safely convert it into a motor tricycle. This code does not cover the design and certification of a motor tricycle as an Individually Constructed Vehicle (ICV).

The original vehicle manufacturer (OVM) refers to the entity holding the first stage Identification Plate Approval (IPA). The base motorcycle used for motor tricycle conversion using this code must be a standard LC category motorcycle as manufactured by the OVM and without any significant modifications such as those involving engine, driveline, frame, suspension and brakes. An ICV motorcycle must not be used.

The base motorcycle frame must not be modified by cutting or welding. The modified vehicle must be capable of being converted back into the original motorcycle using hand tools only.

This code is not to be used for certifying modifications to new light vehicles before first registration in Australia.

This code is not a prescriptive standard, as defined in the *Professional Engineers Act 2002*. When certifying modifications using this code, application of engineering principles and professional engineering judgement is needed.

### 1.1 Modifications permitted under Code LL1

Modifications that may be certified under LL1 code are:

- Fitting of a standard production kit that converts a motorcycle (LC category) into a motor tricycle (LEM1 category);
- Custom kits or modified production kits are permitted in some circumstances subject to endorsement by an RPEQ engineer.

### 1.2 Modifications not permitted under Code LL1

Modifications that must not be certified under LL1 code are:

- Modifications other than those described in Section 1.1;
- Design and certification of a motor tricycle as an ICV;

- Modifications resulting into motor tricycle of categories LEP1, LEG1 or LEG2 or LEM2 or LEP2;
- Further modifications to a motor tricycle of any type;
- Modifications to convert a motorcycle into a motor tricycle where the base vehicle is not a standard, unmodified, production motorcycle of LC category.

## 2.0 General Requirements

The base motorcycle must be in serviceable and safe condition.

Modifications to a vehicle's frame and body may affect the warranty provided by the OVM. Consideration of the effect that modifications under this code may have on product warranty is outside the scope of this code. The certifying Approved Person (AP) must clarify this point with the modifier and the vehicle operator.

For audit purposes, sufficient evidence of the modification and its inspection must be kept by the certifying AP. Typically this may include photographs, sketches, engineering drawings, measurements and test reports, sheets of calculations and analysis, Registered Professional Engineer of Queensland (RPEQ) assessment reports, manufacturer's instructions, images of certification markings and completed checklists.

### 2.1 Compliance with applicable vehicle standards

- 2.1.1** The modified vehicle must continue to comply with the Australian Design Rules (ADRs) applicable at the date of manufacture of the base motorcycle.
- 2.1.2** Different and/or more ADRs may apply to the modified vehicle due to vehicle category change. The modified vehicle must comply with those ADRs that apply to its category after modification.
- 2.1.3** The modified vehicle must also comply with the applicable in-service requirements of the *Transport Operations (Road Use Management—Vehicle Standards and Safety) Regulation 2021* (the VSS Regulation).
- 2.1.4** A pre-ADR modified vehicle must continue to comply with the VSS Regulation.
- 2.1.5** Specific requirements, if listed in Section 3.0 of this code, take precedence over the general requirements in Section 2.0.
- 2.1.6** Outlined in Table LL1-1 are areas of the vehicle that may be affected by the modifications and may require re-certification, testing and/or data to show compliance of the modified vehicle.

**Table LL1-1 List of items and affected ADRs**

<b>Detail</b>	<b>Requirements</b>
Lights and Light Signalling Devices	ADR 19/.. or ADR 67/00
Passenger Car Tyres	ADR 23/..
Brakes	ADR 33/..
Motorcycle Noise	ADR 39/00 or ADR 83/00
General Safety Requirements	ADR 42/..
Vehicle Configuration and Dimensions	ADR 43/..
Lamps on L Group Vehicles	ADR 53/00 and ADR 55/00
Special Requirements on L Group Vehicles	ADR 57/00
Vehicle Marking	ADR 61/..
Mechanical Connections between Vehicles	ADR 62/..

**Note:** This is not an exhaustive list and compliance to other ADRs may also be affected

The ADR applicability is according to the base motorcycle's date of manufacture. It is the responsibility of the certifying AP to refer to the proper ADRs applicable to the vehicle.

Sections 2.2 to 2.8 relate to the general requirements applying to different areas of the modifications under LL1 code. Requirements in Section 3.0 "Specific Requirements" override requirements in sections 2.2 to 2.8 below if there is any conflict.

## **2.2 Motor Tricycle Frame**

**2.2.1** The certifying AP must assess the motor tricycle frame as being suitable for the specific make/model of the motorcycle and fit for purpose. While documentation and certification provided by the kit manufacturer may be taken into consideration, the certifying AP is responsible for final assurance of its suitability and adequacy.

**2.2.2** The installation of the kit must comply with the manufacturer's instructions and any amendments that are made and documented by the certifying AP.

- 2.2.3** Motor tricycle frame serial number must be documented but the modified vehicle will continue to be identified using the Vehicle Identification Number (VIN) and the engine number of the unmodified motorcycle.
- 2.2.4** Installation of the motor tricycle frame must not interfere with other moving parts of the motorcycle and must not protrude in a way that poses risk of injury to the rider, passenger, and other road users.
- 2.2.5** Fitting of the motor tricycle frame must not require the modification by cutting or welding of the original motorcycle frame. The modified vehicle must be capable of being converted back into the original motorcycle using hand tools only.

## **2.3 Fasteners**

- 2.3.1** The certifying AP must assess the fastener requirements as being suitable for the specific locations and fit for purpose. While the fasteners provided by the kit manufacturer may be taken into consideration, the certifying AP is responsible for final assurance of their suitability and adequacy.
- 2.3.2** When fixing panels and lightly loaded brackets, upgraded bolts must be used.
- 2.3.3** In the absence of any other instructions, as a minimum SAE Grade 8 or Metric 10.9 grade bolts must be used for brake calipers, master/slave cylinder mounts and all heavily loaded attachments. Stainless steel bolts must not be used in critically loaded areas.

## **2.4 Ground Clearance and Maximum Width**

- 2.4.1** Motor tricycle must comply with the relevant requirements of ADR 42/.. and ADR 43/...
- 2.4.2** As examples only, minimum running clearance of 100 mm and maximum width 2,000 mm.

## **2.5 Drive Shaft, Drive Chain and Drive Belt**

- 2.5.1** Rider and passenger(s) must be protected from drive shaft, drive chain and drive belt. The possibility of contact with moving or rotating parts must be prevented.
- 2.5.2** More extensive guarding may be needed than is necessary for a solo motorcycle.

## **2.6 Electrical**

- 2.6.1** Motor tricycle derived from a motorcycle built after 1 July 1988 must comply with ADR 67/00. For tricycles derived from motorcycles built prior to this date the requirements of the VSS Regulation apply.
- 2.6.2** Individual lamps and reflectors must comply with the relevant ADR that applies to that lamp type. For example, ADR 55/00 for headlamps.

## 2.7 General Safety Requirements

- 2.7.1 All motor tricycles fitted with automatic transmissions (manual valve bodies included) must be fitted with a neutral/park safety switch. The switch must prevent operation of the starter motor when a forward or reverse gear has been selected. Transmission selectors must be designed so that there can be no accidental engagement of reverse gear.
- 2.7.2 Wiring must comply with ADR 42/...

## 2.8 Miscellaneous

- 2.8.1 Excepting non-enclosed LEM1 vehicles with an 'Unladen Mass' of less than 450 kg, motor tricycles must be capable of being so operated by the driver from the normal seating position that they may be propelled both forwards and backwards.
- 2.8.2 Certifying AP must measure and report the completed unladen mass of the motor tricycle.
- 2.8.3 If the conversion kit is not a standard production kit, that is, it is either a unique one-off kit or a modified production kit, the kit design must be endorsed by a person with RPEQ qualification.

## 2.9 Vehicle Condition

- 2.9.1 The base motorcycle and the completed motor tricycle must be in sound and roadworthy condition and free of any defects.

## 3.0 Specific Requirements

The following specific requirements apply to modifications certified under this code. Requirements in this section override requirements in sections 2.2 to 2.8 above if there is any conflict.

### 3.1 Stability Compliance Testing

- 3.1.1 The motor tricycle must comply with requirements of Clause 21 of ADR 42/04. This is regardless of the motorcycle's date of manufacture.
- 3.1.2 Test must be conducted, and evidence kept in the form of a formal report to show that the Static Stability Ratio (SSR) of the LEM1 motor tricycle is 1.0 or less.
- 3.1.3 While documentation and certification provided by the kit manufacturer may be taken into consideration, the certifying AP is responsible for final assurance of the Static Stability Ratio of the completed motor tricycle and its compliance to Clause 21 of ADR 42/04.

- 3.1.4** SSR of the motor tricycle must be reported in the completed checklist and in the Certificate of Modification.
- 3.1.5** The make/model/serial number of the motor tricycle kit must be recorded on the stability test report.
- 3.1.6** A copy of the installation instructions supplied by the motor tricycle kit manufacturer must be kept by the certifying AP.
- 3.1.7** All changes to the installed parts and the installation procedures that vary from the motor tricycle kit manufacturer's supplied items must be documented and endorsed by a person with RPEQ qualification.
- 3.1.8** While the stability test in ADR 42/04 is a minimum requirement, the certifying AP must ensure, by conducting any added handling testing necessary, that the motor tricycle is safe to use on road under various riding conditions and traffic situations.
- 3.1.9** Sound engineering practice and good quality of workmanship must be evident in the installation of motor tricycle conversion kit.

### **3.2 Exhaust System and Noise Emission**

- 3.2.1** As far as possible, exhaust and noise control systems must not be modified.
- 3.2.2** The certifying AP must ensure that the motor tricycle complies with the requirements of the relevant ADR for external noise.
- 3.2.3** If the exhaust system or exhaust silencer is modified, tests must be conducted to show that the vehicle complies with the requirements in drive-by and stationary modes.

### **3.3 Brakes**

- 3.3.1** Braking systems using a combination of hand and foot controls to apply front and rear brakes separately must meet the requirements of the front and rear brake tests of ADR 33/... For pre-ADR motorcycles, see the requirements of Table LG4 in the *National Code of Practice for Light Vehicle Construction and Modification* (NCOP) Section LG and the requirements in the VSS Regulation.
- 3.3.2** A parking brake is needed on motor tricycles and must comply with the requirements in ADR 33/... Gradient holding capability must be verified, and evidence kept.
- 3.3.3** It must be verified that master cylinder(s) have sufficient travel to service braking system with completely worn-out pads and shoes.
- 3.3.4** Recommended minimum diameter of the manufactured pushrod between the brake pedal/lever and the master cylinder be as per table LL1-2:



**Table LL1-2 Recommended minimum diameter of the manufactured pushrod**

<b>Pushrod Length mm</b>	<b>Pushrod (minimum) Diameter mm</b>
Up to 250	10
251 to 400	12
401 to 600	14

- 3.3.5** While documentation and certification provided by the kit manufacturer may be taken into consideration, the certifying AP is responsible for the final assurance of the compliance of the completed motor tricycle to ADR 33/...
- 3.3.6** All changes to the installed parts and the installation procedures that vary from the kit manufacturer's supplied items must be documented and endorsed by a person with RPEQ qualification.
- 3.3.7** Sound engineering practice and good quality of workmanship must be evident in the installation of additional/replacement braking system components.

### **3.4 Rear Suspension**

- 3.4.1** The rear suspension of the motor tricycle must be suitable for the kit and fit for purpose. While documentation and certification provided by the kit manufacturer may be taken into consideration, the certifying AP is responsible for the final assurance that the rear suspension is safe and fit for purpose.
- 3.4.2** If the live axle is located longitudinally by pivoted radius arms or four-bar linkages that are fabricated from mild steel, the suggested limits of Table LL1-3 below apply:

**Table LL1-3 Suggested limits of Tube**

Maximum Length	900 mm
Minimum Outside Diameter of Tube	22 mm
Minimum Wall Thickness of Tube	3 mm

- 3.4.3** If threaded ends are used with 3mm wall thickness tubing, a bush must be welded into the end of the tube to accommodate the thread. Heim joints must not be used as a suspension or steering component without assessment and certification by an RPEQ engineer.
- 3.4.4** Sound engineering practice and good quality of workmanship must be evident in the installation of the rear suspension.

### **3.5 Rims and Tyres**

- 3.5.1** If passenger car tyres are fitted, they must comply with ADR 23/... The speed rating and load index must be suitable for the motor tricycle. Tyre and rim selection must comply with ADR 42/...
- 3.5.2** Rims, tyres, and their combination must be according to the Tyre & Rim Association of Australia manual. The load carrying capacity of any rim fitted must be greater than the load placed on that rim by the modification.
- 3.5.3** Front and rear tyres must be of same carcass construction that is, either radial or bias belted.
- 3.5.4** A tyre placard must be attached to the vehicle clearly showing the rim and tyre sizes, speed & load rating, and tyre inflation pressures applicable to that vehicle; alternatively, the relevant information must be provided in the vehicle owner's manual.

## **4.0 User Information**

The vehicle operator must be informed of the changes made to the vehicle and the proper use of the equipment installed.

### **4.1 Information about motor tricycle kit**

Vehicle owner must be supplied with the details of the motor tricycle kit fitted, modifications made and instructions on the care and maintenance of the system.

## **5.0 Limitations**

Section 1.2 of this code provides information about which types of modifications are not allowed to be certified under the LL1 code. In addition, the following limitations apply.

### **5.1 Anti-lock Braking System**

If the unmodified vehicle is fitted with Anti-lock Braking System (ABS) by the OVM or is required to be fitted, the following conditions must be met:

- 5.1.1** ABS must not be disabled.
- 5.1.2** It must be ensured that after the modifications, the system is free from any fault signals.
- 5.1.3** It must be ensured that the original ABS of the base motorcycle can be restored, when, the trike conversion kit is removed.

## 6.0 Additional Modifications and Changes to Vehicle Category

If more modifications are made that may or may not be essential for fitting of the motor tricycle kit, all such modifications must be assessed separately and certified or approved. For example, a change to the engine or brake type.

As the vehicle's ADR category has been changed due to the fitting of the kit, the vehicle must comply with the vehicle standards that apply to it in its new category. Certification of such compliance using an appropriate LO code must be provided.

## Checklist LL1

### CODE LL1: Modifications to Motorcycle (LC category) to convert to Motor Tricycle (LEM1 category)

Form No: LL1

Provide an answer to each of the following (Y=Yes, N=No)

<b>Modification Certificate Number:</b>	_____	
<b>1</b>	<b>General</b>	
1.1	Is the motor tricycle conversion within the scope of this code? (See Section 1 of this code)	<input type="checkbox"/> Y <input type="checkbox"/> N
1.2	If the modification uses a standard production kit for motor tricycle conversion, please record Make of the kit _____ Model of the kit _____ Serial Number of the kit _____	
1.3	If the modification uses a customised kit or modified production kit, has it been endorsed by a person with RPEQ qualification?	<input type="checkbox"/> Y <input type="checkbox"/> N
<b>2</b>	<b>Compliance to relevant ADRs</b>	
2.1	Does the motor tricycle comply with the relevant Australian Design Rules?	<input type="checkbox"/> Y <input type="checkbox"/> N
2.2	Is the relevant checklist in the NCOP VSB-14 completed and kept? Is the below checklist suitably adapted for this conversion?  Relevant Checklist is for LEM1 Motor tricycle- Use LO4-LEM1 Checklist in NCOP15A Section	<input type="checkbox"/> Y <input type="checkbox"/> N
<b>3</b>	<b>Testing of Motor tricycle</b>	
3.1	Is brake performance test conducted according to ADR 33/... and a report kept?  Report Number _____ Date _____  Administrator's Circular 33-2-1 may be used as guidance	<input type="checkbox"/> Y <input type="checkbox"/> N
3.2	Is motor tricycle stability performance test conducted according to this code and a report kept?  Report Number _____ Date _____	<input type="checkbox"/> Y <input type="checkbox"/> N

[Continued on the following page]

3.3	Is the tricycle assessed for safe road handling (using suitable additional tests, if necessary) and confirmed as being satisfactory?	<input type="checkbox"/> Y <input type="checkbox"/> N
3.4	If the exhaust is modified, is it confirmed that the tricycle meets the relevant ADR requirement for external noise and a report kept?  Report Number _____ Date _____	<input type="checkbox"/> Y <input type="checkbox"/> N
3.5	Is the motor tricycle assessed for satisfactory handling performance in loaded condition and a report kept?  Report Number _____ Date _____	<input type="checkbox"/> Y <input type="checkbox"/> N
<b>4</b>	<b>Miscellaneous</b>	
4.1	Is the rider's seat of motorcycle type, that is, straddle type only?	<input type="checkbox"/> Y <input type="checkbox"/> N
4.2	For applicable motor tricycle type, is it fitted with a reversing gear and performs satisfactorily?  In case of non-applicable motor tricycle type, respond by circling "Y"	<input type="checkbox"/> Y <input type="checkbox"/> N
4.3	Is the proper tyre placard fitted or alternatively is the relevant information provided in the owner's handbook? and  Do the tyres and rims fitted conform to that placard or instructions in owner's handbook?	<input type="checkbox"/> Y <input type="checkbox"/> N
4.4	Is the motor tricycle frame installed according to the manufacturer's instructions kit, using the parts supplied in the kit?  If not, are the variations recorded and approved by a professional RPEQ engineer?	<input type="checkbox"/> Y <input type="checkbox"/> N
4.5	Is the modification carried out by adopting sound engineering practices and the quality of good workmanship evident?	<input type="checkbox"/> Y <input type="checkbox"/> N
<b>5</b>	<b>Antilock Braking System (ABS, if fitted)</b>	
5.1	Is it ensured that the ABS is not disabled?  If ABS is not fitted or is not required to be fitted to the base motorcycle, respond by circling "Y"	<input type="checkbox"/> Y <input type="checkbox"/> N
5.2	Is it ensured that there are no ABS fault warnings?  If ABS is not fitted, respond by circling "Y"	<input type="checkbox"/> Y <input type="checkbox"/> N

**Note:** If the answer to any question is **N (No)** the motor tricycle cannot be certified under LL1 code.

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CERTIFICATION DETAILS																	
<b>Make</b>																	
<b>Model</b>																	
<b>Year of Manufacture</b>																	
<b>VIN (if applicable)</b>																	
<b>Chassis Number (If applicable)</b>																	
<b>Brief Description of Modification(s)</b>																	
<b>Vehicle Modified by (if applicable)</b>																	
<b>Certificate of Modification Number</b>																	
<b>Name of the Certifying AP (Print)</b>																	
<b>Name of the Employer of the Certifying AP (If applicable)</b>																	
<b>Signature of the Certifying AP</b>												<b>Date</b>					