

Queensland Code of Practice: Vehicle Modifications (QCOP)

Code LC3: Vehicle Controls for Persons with a Disability (Design)

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CODE LC3

Vehicle Controls for Persons with a Disability (Design)

1.0 Scope

Code LC3 outlines the minimum design, specifications and fabrication requirements for the following light vehicle modifications involving controls for driver training.

1.1 Designs permitted under Code LC3

The following is a summary of the designs that may be prepared under Code LC3:

- Vehicle control modification (design) for persons with a disability, which are not covered by AS 3954 *Motor vehicle driver controls – Adaptive systems for people with disabilities*;
- Vehicle control modification (design) for persons with a disability, which are not covered by an existing individual Department of Transport and Main Roads (TMR) Type Approval.

1.2 Designs not permitted under Code LC3

The following is a summary of the designs that are not covered under Code LC3:

- Vehicle controls conversion/modification for other than for persons with a disability;
- Design of dual-control system for driver training vehicles.

2.0 Compliance with applicable vehicle standards

All work must also comply with the requirements contained in sub-section 2.0 General Requirements of the *Queensland Code of Practice (QCOP) – Section LC Vehicle Controls*. Specific requirements in this code take precedence over any general instructions in QCOP.

Extensive modifications to a vehicle may affect the warranty provided by the OVM. It is the responsibility of the certifying AP to consider such effect on warranty. Consideration of the effect this modification may have on product warranty is outside the scope of this code. The certifying AP must clarify this point to the modifier and the vehicle operator.

For audit purposes, sufficient documentary and photographic evidence of the modification must be retained by the certifying AP.

2.1 Compliance with applicable vehicle standards

- 2.1.1** The modified vehicle must continue to comply with the applicable Australian Design Rules (ADRs).

- 2.1.2** If different or additional ADRs apply to the modified vehicle due to the modifications, the vehicle must comply with those ADRs that apply to it after modification.
- 2.1.3** A 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 LC3-1 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 LC3-1 Summary of items that if modified, may detrimentally affect compliance with applicable ADRs

DETAIL	REQUIREMENTS
Brake Lights	ADR 13/00 ADR 60/00
Brake Hoses	ADR 42/..
Hydraulic Brake Systems	ADR 31/.. ADR 33/.. ADR 35/..
Supplementary Restraint Systems	ADR 69/00 ADR 72/00 ADR 73/00
Brake Performance	<i>Transport Operations (Road Use Management—Vehicle Standards and Safety) Regulation 2021</i>

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

The ADR applicability is according to the vehicle's category and date of manufacture. It is the responsibility of the certifying AP to verify compliance to the applicable ADRs. The certification must include the vehicle date of manufacture in addition to the date of modification.

3.0 Specific Requirements

3.1 Disabling Airbags

Airbags are part of the Supplementary Restraint System (SRS) fitted by new vehicle manufacturers as part of their approval process to comply with ADRs including ADR 69/00 (Full Frontal Impact Occupant Protection), ADR 72/00 (Dynamic Side Impact Occupant Protection) and/or ADR 73/00 (Offset Frontal Occupant Protection). The introduction of SRSs has been a major advance in protecting people from death or injury in road crashes and the majority of vehicle manufacturers do not endorse the disabling of SRS components such as airbags.

As the use of SRSs has proven to be so successful, TMR does not readily support the reduction of occupant safety if other options are available. However, TMR will approve the disabling of the airbags (knee airbags) where it can be demonstrated by the Approved Person (Engineer) that:

- there currently is no readily available alternative design hand controls which could be used which would not require the driver's airbag to be disabled or modified, and
- the disabling of the driver's airbag will not interfere with any other parts of the SRS fitted to the vehicle such as seatbelt pre-tensioners or other airbags.

3.2 Strength Testing (Normative)

3.2.1 Scope

This section sets out a method for testing a fully assembled hand control for strength.

3.2.2 Principle

The test specimen is fully assembled and fitted to a test rig. A force is applied to the handle of the brake control and left in place for a specified period. The hand control system is then inspected.

3.2.3 Apparatus

The following apparatus is required:

- (a) A suitable test rig to which the hand control under test can be fixed at its designed mounting points. The part of the rig that simulates the brake pedal shall be an immovable fixture.

Note: The test rig could be a vehicle with the brake pedal blocked as in the test for strength of hand control in brake operation in AS 3954.

- (b) A means of applying a force of 670 N to the handle of the control lever which is designed to activate the brake.

3.2.4 Procedure

The procedure shall be as follows:

- (a) Fix the fully assembled hand control to the test rig at its designed mounting points in accordance with the AP Engineer/Manufacturer's instructions for installation.
- (b) Apply a force of 670 N to the handle of the control lever in the direction in which the control is intended to be operated for a period of 30 seconds.
- (c) Release the force and note any failure, changes in alignment, loosening of parts, or permanent deformation of any part of the hand control.

3.2.5 Report

The following shall be reported:

- (a) The identity of the hand control.
- (b) Any failure, change in alignment, parts which became loose, or permanent deformation of any part of the hand control.
- (c) A reference to this test method, ie AS 3954:2019, Appendix E.

3.3 Dynamic testing for determining fatigue resistance (Normative)

3.3.1 Scope

This section sets out a method for testing a hand control for a resistance to fatigue.

3.3.2 Principle

The test specimen is fully assembled and fitted to a test rig. A force is applied to actuate the brake and accelerator controls which are operated for specified number of cycles prior to inspection taking place. If no specified indicators of fatigue are noted, the test continues for a total of 250 000 cycles.

3.3.3 Apparatus

The following apparatus is required:

A suitable test rig with:

- (a) A simulated accelerator pedal capable of adjustment to provide a load of not less than 50 N at full stroke of the hand control/accelerator linkage;

- (b) Simulated clutch and brake pedals which are capable of adjustment to provide a load not less than 200 N at the maximum travel of the clutch and brake linkages respectively; and
- (c) A means of moving the hand control repeatedly throughout its full range of movement within a time period of not more than 2 seconds.

3.3.4 Procedure

The procedure shall be as follows:

- (a) Fix the fully assembled hand control to the test rig according to the Approved Person (Engineer)/manufacturer's instructions, and adjust to the configuration representing the minimum mechanical advantage, and with the maximum offset specified by the Approved Person (Engineer)/Manufacturer.
- (b) Apply a force which moves the hand control through its complete design cycle in a period not greater than 2 seconds. It is permissible to perform the operation of more than one pedal in one cycle of movement.
- (c) After 50 000 cycles stop and inspect the hand control and observe and note if any failure, change in alignment that would be likely to affect normal operation, or loosening of fasteners has occurred. If any failure, change in alignment that would be likely to affect normal operation, or loosening of fasteners is observed, the test shall not proceed.
- (d) Replace any worn parts other than structural components and lubricate as necessary.
- (e) Repeat steps (b) to (d) four (4) times so that 250 000 cycles are completed.

3.3.5 Report

The following shall be reported:

- (a) The identity of the hand control.
- (b) Any failure, change in alignment that would be likely to affect normal operation, appreciable wear of structural components, or loosening of fasteners.
- (c) A reference to the test method, ie. AS 3954:2019, Appendix F.

3.4 Fastener Vibration Resistance Testing (Normative)

3.4.1 Scope

This section sets out a method for testing a hand control for retention of torque on fasteners.

3.4.2 Principle

The test specimen is fully assembled and fixed to a shaker table. The table is subjected to vibration for a specified period. The torque of each fastener used in the construction of the hand control is measured and recorded.

3.4.3 Apparatus

The following apparatus is required:

- (a) A shaker table.
- (b) An accelerometer.
- (c) A vibration meter.
- (d) A torque-measuring device.

3.4.4 Procedure

The procedure shall be as follows:

- (a) Secure the fully assembled hand control to the shaker table only at the designed mounting points according to the Approved Person (Engineer)/manufacturer's instructions for installation. The hand control shall be mounted so that the axial direction of vibrations approximates the axial direction of the hand control. Where the axial direction of the hand control is not obvious, the axial direction shall be taken to be parallel to the axis of the steering column of the vehicle for which the hand control was designed, when installed.
- (b) Apply the torque specified by the manufacturer to all fasteners of components of the hand control.
- (c) Mount the accelerator onto the shaker table (For method of mounting see AS 2775). All connections between the accelerometer and the vibration meter and any auxiliary equipment shall be in accordance with the requirements of AS 2679.
- (d) Subject the shaker table to vibratory motion producing a peak table acceleration of not less than 46 m/s^2 and a peak-to-peak displacement of not less than 2.5 mm at $30 \pm 3 \text{ Hz}$ in the axial and transverse directions of the assembly for a period of 30 minutes in each direction.
- (e) Measure and record the torque necessary to initiate tightening of each fastener, in Newton Metres.
- (f) Repeat steps (a) to (e) with the hand control mounted so that the direction of vibration is approximately transverse to the axial direction of the hand control.

3.4.5 Report

The following shall be reported:

- (a) The identity of the hand control.
- (b) For each fastener, any variance in torque applied in Step (b) and measured in Step (e) in 3.4.4 above.
- (c) A reference to this test method, ie. AS 3954:2019, Appendix G.

3.5 Additional Requirements

- Where an additional accelerator pedal is fitted to the left of the existing brake or clutch pedals (or both), both the left-hand and the right-hand pedals shall be independently capable of being rendered inoperative.
- The driving controls shall be able to be operated through its full range of travel.
- Those components susceptible to wear and tear, eg. pins, shafts and connections etc., shall be accessible for replacement.
- All metal parts shall be resistant to corrosion.
- The surface finish of all parts of the driver controls in the driver's view shall be dull non-reflective to avoid undue glare to the driver.

Checklist LC3

CODE LC3: Vehicle Controls for Persons with a Disability (Design)

Form No: LC3

Provide an answer to each of the following (N/A=Not Applicable, Y=Yes, N=No)

Modification Certificate Number:		
1	Components	
1.1	Are the components designed with sufficient strength to prevent any permanent deformation occurring during use (including emergency application)?	<input type="checkbox"/> Y <input type="checkbox"/> N
2	Seats and Seat Belts	
2.1	Do seats, seat and seat belt mountings and seat belts comply with relevant ADR 4 and 5 requirements?	<input type="checkbox"/> Y <input type="checkbox"/> N
3	Controls	
3.1	Have the controls been designed to require distinctly different motions for acceleration, brake actuation or clutch application, where applicable?	<input type="checkbox"/> Y <input type="checkbox"/> N
3.2	Have the hand controls been designed so that when released, controls shall revert to the neutral or off position?	<input type="checkbox"/> Y <input type="checkbox"/> N
3.3	The hand controls do not permit actuation of the accelerator by forward inertial movement of the driver.	<input type="checkbox"/> Y <input type="checkbox"/> N
3.4	Have all the requirements in '3.5 Additional Requirements' been met?	<input type="checkbox"/> Y <input type="checkbox"/> N
4	Performance Requirements	
4.1	Strength	
	When tested in accordance with '3.2 Strength Testing', there shall be no failure, no changes in alignment, no loosening of parts, or no permanent deformation of any part of the hand controls. Have these requirements been met?	<input type="checkbox"/> Y <input type="checkbox"/> N

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4.2	Fatigue Resistance	
	When tested in accordance with '3.3 Dynamic testing for determining fatigue resistance' there shall be no failure, no changes in alignment that would be likely to affect normal operation, no appreciable wear of structural components or no loosening of fasteners. Have these requirements been met?	<input type="checkbox"/> Y <input type="checkbox"/> N
4.3	Vibration Resistance of Fasteners	
	When tested in accordance with '3.4 Fastener Vibration Resistance Testing', any variance in torque of each fastener of the fully assembled hand control shall be not more than 15% of the torque specified by the manufacturer. Has this requirement been met?	<input type="checkbox"/> Y <input type="checkbox"/> N
5	ADR Compliance	
5.1	Does the modified vehicle continue to comply with the ADRs that applied to it at its first supply to market in Australia?	<input type="checkbox"/> Y <input type="checkbox"/> N
5.2	Has the SRS system (knee airbag) fitted to this vehicle been modified, and if so has it been confirmed that the remaining SRS components and systems operate as per original vehicle manufacturer's specifications?	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
6	Workmanship	
6.1	Does the installation and fabrication design meet the requirements specified by the Occupational Therapist/Doctor?	<input type="checkbox"/> Y <input type="checkbox"/> N
6.2	Does the installation and fabrication design meet recognised engineering standards?	<input type="checkbox"/> Y <input type="checkbox"/> N
7	Records	
7.1	Have complete records of the design been retained in a manner suitable for auditing by TMR?	<input type="checkbox"/> Y <input type="checkbox"/> N

Note: If the answer to any question is **N (No)** the conversion cannot be certified under Design Code LC3.

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