

Queensland Code of Practice: Vehicle Modifications (QCOP)

Code LH13: Light Vehicle Modifications for Chassis Alteration (Design Certification)

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CODE LH13

Light Vehicle Modifications for Chassis Alteration (Design Certification)

1.0 Scope

The LH13 modification code specifies requirements for certifying designs for chassis alterations of light vehicles, that being vehicles having a Gross Vehicle Mass (GVM) rating that does not exceed 4,500 kg.

This code covers designs to eligible light vehicles under the following Australian Design Rule (ADR) categories: MB, MC, MD1, MD2, MD3, NA and NB1. The code covers chassis modifications, not already covered in the *National Code of Practice (NCOP) – Light Vehicle Modifications (VSB 14)*, that are required to support other modifications. This code does not cover the modifications related to changing of the original wheelbase, fitting of components that are not compatible with the original vehicle components and chassis modifications that does not meet the requirements of VSB 14.

The original vehicle manufacturer (OVM) refers to the entity holding the first stage Identification Plate Approval (IPA). An entity holding the Second Stage Manufacture (SSM) Approval or Registered Automotive Workshop Scheme (RAWS) Approval is not deemed as the OVM.

In cases where the OVM has not specified a GVM rating, the maximum laden mass at which the OVM has shown compliance with the ADRs is to be taken as the original GVM rating. This information must be obtained from a reliable and traceable source.

This code is not to be used for certifying modifications to new light vehicles before being provided to market in Australia. To certify modifications to heavy vehicles, that being vehicles that exceed 4,500 kg GVM or Aggregate Trailer Mass (ATM), refer to the *National Code of Practice for Heavy Vehicle Modifications (VSB 6)*.

1.1 Modifications permitted under Code LH13

Designs that may be certified under LH13 code are:

- Chassis alterations not covered under VSB 14 that is required to support other modifications. This includes repair, reinforcing or changes required to the chassis for the modification of suspension, for example, chassis shortening behind original rear suspension.
- Cross-member alteration.

1.2 Modifications not permitted under Code LH13

Designs that must not be certified under LH13 code are:

- Modifications other than those described in Section 1.1.
- Modifications to vehicles that are not mentioned in Section 1.3.
- Alterations already covered in VSB 14.
- Modifications to the original wheelbase.
- Fitting of components not compatible with original vehicle components.

1.3 Vehicle categories permitted to be certified under Code LH13

Modifications that may be permitted as described in Section 1.1 must be in one of the vehicle categories as specified by Table LH13-1.

Table LH13-1 List of permitted vehicles for LH13 modification

Vehicle Category	Category Code
Forward-control passenger vehicle	MB
Off-road passenger vehicle	MC
Light omnibus up to 3.5 tonnes GVM and up to 12 seats up to 3.5 tonnes GVM and more than 12 seats over 3.5 tonnes and up to 4.5 tonnes GVM	MD1 MD2 MD3
Light goods vehicle	NA
Medium goods vehicle over 3.5 tonnes and up to 4.5 tonnes GVM	NB1

2.0 General Requirements

All work must also comply with the requirements contained in sub-section 2 *General Requirements* of Section LH of VSB 14. Specific requirements in this code take precedence over any general instructions in VSB 14.

Extensive modifications to a vehicle may affect the warranty provided by the OVM. It is the responsibility of the certifying Approved Person (AP) to consider the effect of the modification on warranty and clarify this point to the modifier and vehicle operator prior to modification, if affected. 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 ADRs that apply to it.
- 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 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 requirements in Section 2.0.
- 2.1.6** Outlined in Table LH13-2 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 LH13-2 List of items and likely affected ADRs

DETAIL	REQUIREMENTS
Side Door Latches and Hinges	ADR 2/..
Seat and Seat Anchorages	ADR 3/..
Seatbelts and Seatbelt Anchorages	ADR 4/.., 5/..
Child Restraints and Child Restraint Anchorages	ADR 5/.., 34/..
Additional Windows	ADR 8/..
Steering Columns	ADR 10/..
Rear Vision Mirrors	ADR 14/..
Side Impact Protection	ADR 29/.., 72/.., 85/..
Braking System	ADR 31/.., 35/.., 88/..
General Safety Requirements	ADR 42/..
Vehicle Configurations and Dimensions	ADR 43/..
Specific Purpose Vehicles	ADR 44/..
Omnibuses for Hire and Reward Requirements	ADR 58/..
Omnibus Rollover Strength	ADR 59/..
Occupant Protection in Buses	ADR 68/..
Front Impact Protection	ADR 69/..

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.

Sections 2.2 to 2.3 relate to the general requirements applying to different areas of the modifications under LH13 code.

2.2 Modification details

2.2.1 The modification must be designed in accordance with the OVM's guidelines if applicable and a copy of the instructions supplied must be retained.

- 2.2.2** A modification to the vehicle chassis may require the vehicle's braking system to be re-certified to the appropriate modification code and/or ADR.

2.3 Fasteners, padding, welding and electroplating

- 2.3.1** Requirements and guidance are contained within the following sections of VSB 14 Section LZ Appendices:

- for the use of fasteners, *Appendix A Fasteners*;
- for the use of foam padding, *Appendix B Foam Padding for Occupant Protection*;
- for welding techniques and procedures, *Appendix C Heating and Welding of Steering Components*; and
- for electroplating, *Appendix D Electroplating*.

- 2.3.2** Conflicting requirements, if any, in Section 3.0 related to fasteners, padding, welding or electroplating override the general requirements in this section.

3.0 Specific Requirements

The following specific requirements apply to relevant modifications under this code.

3.1 Bolts and fasteners

- 3.1.1** Bolt diameter selection should be in accordance with the OVM's recommendations.
- 3.1.2** All bolts for structural purposes must be high tensile bolts of at least ISO Grade 8.8 (SAE Class 5).
- 3.1.3** Bolts used to secure suspension hangers and brackets to the chassis must be of at least ISO Grade 10.9 (SAE Class 8).
- 3.1.4** The use of countersunk bolts should be avoided or, if unavoidable, allowances should be made for the lower tensile capabilities of the countersunk bolts.
- 3.1.5** All nuts used for cross-members must be self-locking.

3.2 Welding

- 3.2.1** Welds that are traverse to rail flanges should be avoided and is not permitted in areas of high stress.
- 3.2.2** Traverse welding on chassis flanges must only be done as part of a repair or join in the chassis.
- 3.2.3** Chassis welding should be performed on both sides to ensure full penetration, where possible.
- 3.2.4** All welds should be ground flush, a 10% increase in chassis thickness is permissible but not recommended. The welds should not exhibit any excessive undercutting and should not be within 15 mm of the edge or bend radius of a chassis flange.
- 3.2.5** Welding must not be done within 40 mm of the edge of a cross-member gusset.

3.3 Chassis design and reinforcement

- 3.3.1 For chassis repair or removal of material, a torsion rigidity test must be performed in accordance to *VSB 14 Section LT Code LT1 – Beaming and Torsion Testing* to ensure the strength and stiffness of the vehicle's structure is of adequate strength.
- 3.3.2 For guidance on the calculation of chassis strength, consult *VSB 6 Section H – Overview*.
- 3.3.3 All reinforcing material thickness must be no more than twice the original vehicle body section thickness.
- 3.3.4 The design must avoid stress concentrations at the end of reinforcing sections.
- 3.3.5 The ends of the reinforcement sections must be designed such that there is a smooth transition to the chassis rail.
- 3.3.6 *VSB 6 Section H – Overview* may be consulted for further design guidance.

3.4 Drilling holes in chassis

- 3.4.1 Holes must be drilled or punched, not flame cut. Any existing holes should not be elongated from drilling or punching into the chassis.
- 3.4.2 Additional holes must not be made in the flanges of the chassis rail unless recommended by the OVM.
- 3.4.3 Additional holes must not be made in the chassis flanges unless recommended by the Original Equipment Manufacturer (OEM) and the attachment method of the OEM is directly replicated. A copy of the instructions supplied must be retained for record keeping.
- 3.4.4 The hole diameter must not exceed the bolt diameter by more than 1.0 mm. The bolts should have sufficient unthreaded under headed length to prevent the thread coming into contact with the inside of the hole.
- 3.4.5 Holes should not be within 50 mm of a chassis rail join.
- 3.4.6 If a hole is added, the centre of the new hole must be at one of the following distances from the centre of the other holes:
 - 50 mm if all holes are less than 17 mm in diameter; or
 - 3 times D away (mm), where D is the diameter of the larger hole, if one of the holes is 17 mm in diameter or greater.

3.5 Chassis cut-outs

- 3.5.1 Chassis cut-outs must be kept to a minimum to avoid excess stress in areas of the chassis.
- 3.5.2 The profile of all cut-outs should have a smooth transition to the original chassis profile.
- 3.5.3 Unless sufficiently reinforced, the chassis cut-out must not be positioned behind the rearmost hanger bracket of the front suspension or in the upper and lower flanges on the same chassis in close proximity.

- 3.5.4** If a chassis cut-out removes more than 50% of the chassis rail flange, additional reinforcement must be provided.
- 3.5.5** All edges of a cut-out must be smoothed out. Imperfections that could initiate cracking of the chassis rail, such as blow holes, must not be allowed.

3.6 Cross-members

- 3.6.1** Additional cross-members must be designed to be compatible with the vehicle chassis and should be installed in accordance to the OVM's recommendations.
- 3.6.2** Cross-members must not be of less strength in vertical load capacity and transverse strength than that of the OVM's for the same application.
- 3.6.3** All new holes in the cross-member gussets must follow requirements of Section 3.4.
- 3.6.4** Avoid the use of cross-members constructed from large rectangular hollow section or pip-cross-members unless supported the original vehicle manufacturer's recommendations.

4.0 Limitations

Section 1.2 of this code provides information about which types of modifications are not permitted to be certified under the LH13 code. In addition, the following limitations apply.

4.1 Electronic Stability Control

If the vehicle is fitted with Electronic Stability Control (ESC) by the OVM, the following conditions must be met:

- 4.1.1** The ESC system must not be disabled.
- 4.1.2** It must be ensured that the modifications being certified do not reduce the effectiveness of the ESC system.
- 4.1.3** The effect of the modification on the ESC system should be considered and recertified if deemed required.

5.0 Additional Modifications and Changes to Vehicle Category

- 5.1** If additional modifications are made that may or may not be essential for any chassis alteration, all such modifications must be assessed separately and certified using appropriate codes or specific approvals. For example, a change in GVM would require certification under the LS11 and LS15 modification codes.
- 5.2** If the vehicle's ADR category has changed due to a change in seating capacity or GVM, the vehicle must comply with the vehicle standards that apply to it in its new category. Certification under such compliance using the appropriate additional code(s) must be provided, for example, certification to the LO1 code, unless specific exemption has been granted for this purpose.

Checklist LH13

CODE LH13: Modification for Chassis Alteration (Design Certification)

Form No: LH13

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

Modification Certificate Number:	_____	
1	General requirements	
1.1	Is the chassis modification outside of VSB 14 permitted chassis modifications?	<input type="checkbox"/> Y <input type="checkbox"/> N
1.2	Is the chassis alteration necessary to support another modification?	<input type="checkbox"/> Y <input type="checkbox"/> N
2	Bolts, fasteners and welding	
2.1	Do all bolts or fasteners meet the applicable requirements of <i>VSB 14 Section LZ Appendices - Appendix A Fasteners</i> and the overriding requirements of Section 3.0?	<input type="checkbox"/> Y <input type="checkbox"/> N
3	Chassis design and reinforcement	
3.1	Is all reinforcing material thickness designed to be no more than twice the original vehicle body section thickness?	<input type="checkbox"/> Y <input type="checkbox"/> N
3.2	Does the design avoid stress concentrations at the end of any reinforcing sections?	<input type="checkbox"/> Y <input type="checkbox"/> N
3.3	If the design includes a chassis repair or reduction of material, does the body design meet the requirements and testing of <i>VSB 14 Section LT Code LT1</i> ?	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
3.4	Are the ends of the reinforcement sections designed so that there is a smooth transition to the chassis rail?	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
3.5	Do all chassis cut-outs meet specifications required in Section 3.0 Specific Requirements ?	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A

[Continued on the following page]

4	Drilling holes in chassis	
4.1	Unless recommended by the original vehicle manufacturer, are all additional holes in the chassis web?	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
4.2	Do all additional holes created meet the specification requirements of Section 3.0 Specific Requirements ?	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
5	Cross-member alteration	
5.1	Are all additional cross-members designed, positioned and attached as recommended by the manufacturer's specifications or, where manufacturer's specifications are unavailable, as specified in this code and VSB 14?	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
6	Additional modifications	
6.1	Are all additional modifications to the vehicle, including a change in ADR category, assessed separately and certified under the appropriate modification codes?	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
7	Electronic Stability Control (ESC)	
7.1	If fitted, is it ensured that the ESC system is not disabled?	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
7.2	If fitted, is it ensured that the ESC system is not made less effective due to modifications carried out under this code?	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
8	Modification details	
8.1	Has the modification been designed in accordance with the manufacturer's guidelines?	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
8.2	Has the vehicle's braking system been tested and re-certified to the appropriate ADR?	<input type="checkbox"/> Y <input type="checkbox"/> N

[Continued on the following page]

9	ADR Compliance	
9.1	Does the modified vehicle continue to comply with all affected Australian Design Rules (ADRs)?	<input type="checkbox"/> Y <input type="checkbox"/> N
10	Design Approval Package (if providing LH13 design certification)	
10.1	Is a comprehensive design package provided?	<input type="checkbox"/> Y <input type="checkbox"/> N
10.2	Does the design package have a unique identification number?	<input type="checkbox"/> Y <input type="checkbox"/> N
10.3	Does the design package clearly describe which make/model/variant/chassis series is covered?	<input type="checkbox"/> Y <input type="checkbox"/> N
10.4	Does the design package include guidance on what to inspect and criteria to decide if the vehicle is in safe and serviceable condition for modifications?	<input type="checkbox"/> Y <input type="checkbox"/> N
10.5	Does the design package include comprehensive work instructions including work to be done, precautions to be taken, control of processes and tests to be conducted?	<input type="checkbox"/> Y <input type="checkbox"/> N
10.6	Has all work, including welding, that has been specified in the certification of the LH13 design, been determined in accordance with recognised engineering standards, relevant Appendices of <i>Section LZ Appendices of NCOP</i> and this code?	<input type="checkbox"/> Y <input type="checkbox"/> N
10.6	Does the design package include a checklist for the modifier of the vehicle?	<input type="checkbox"/> Y <input type="checkbox"/> N
10.7	Does the design package include a checklist for the certifier of the modified vehicle?	<input type="checkbox"/> Y <input type="checkbox"/> N
10.8	Does the design package meet all the requirements of this code?	<input type="checkbox"/> Y <input type="checkbox"/> N

Note: If the answer to any question is **N (No)** the design cannot be certified under LH13 code.

[Continued on the following page]

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						

*Or the Unique Design Package Number, if providing LH13 design certification