

# High Lift - Up to 150mm (Design Certification)

## CODE LS9

Code LS9 applies to ADR category MC, NA and NB1 vehicles.

### 1. Introduction

LS9 code provides modification standards for lifting vehicle ride height by changes to suspension, tyres or body blocks on light vehicles of categories MC (Off Road Passenger Vehicle), NA (Light Goods Vehicle with GVM up to 3,500 kg) and NB1 (Medium Goods Vehicle with GVM up to 4,500 kg).

Increase in ride height due to fitting of alternate tyre and rim that is permitted by the original vehicle manufacturer or otherwise permitted in the relevant Code of Practice without certification is deemed as a **minor modification** and does not require certification.

Increase in ride height (a) up to 50mm due to modified suspension or (b) up to 25mm due to larger tyre or (c) up to 75mm due to combination of (a) and (b) is deemed as a **basic modification** and does not require certification, provided the modification is carried out according to the guidelines in this code and meets the intent of this code. This applies to both vehicles with and without an Electronic Stability Control (ESC) system.

Note that fitting of tyres with larger diameter increases ride height by half that amount. For example, tyres with 50 mm larger diameter increase ride height by 25 mm.

Increase in ride height more than what is stated above and up to 150mm is deemed as a **significant modification** and requires certification according to this code.

Increase in ride height (a) above 75mm due to modified suspension or (b) above 25mm due to larger tyre or (c) above 50mm due to body blocks or (d) above 150mm due to any combination is deemed as an **extensive modification** and requires specific approval from the Department of Transport and Main Roads.

### 2. Scope

This code covers increase in ride height up to 150mm on vehicles of MC, NA and NB1 categories.

Modifications to vehicles with or without an ESC system resulting in a vehicle lift up to 75mm above the original manufacturer's specifications do not require certification, provided the lift is achieved by modified suspension (up to 50mm) and/or larger tyres (up to 25mm). Any lift from body blocks is not included. A person performing this type of modification is encouraged to use the relevant technical requirements of LS9 and LS10 codes as guidance, however no formal certification or lane change test is required.

Codes LS9 and LS10 require that the increase in lift from suspension, tyres and body blocks must not exceed 75mm, 25mm and 50mm respectively. The codes also require that the combined increase in lift must not exceed 150mm. Table LS9-1 further clarifies the above scope.

**Table LS9-1**

Vehicles with and without ESC

<b>Certification</b>	<b>Suspension</b>	<b>Tyres</b>	<b>Body blocks</b>	<b>Total lift</b>
Not required	up to 50mm	up to 25mm	0mm	up to 75mm
Required	up to 75mm	up to 25mm	up to 50mm	up to 150mm

Code LS9 provides for certification of designs that can be used by modifiers and other certifiers as guide to modify a vehicle and to certify a modified vehicle. Code LS10 provides for certification of physical modifications to a vehicle when carried out as specified in the relevant LS9 certification.

Lift modifications that are outside the scope of codes LS9 and LS10 as explained above, require specific approval from the department.

### **2.1 Designs covered by the Code LS9**

The following is a summary of the designs allowed to be certified under Code LS9:

- Increase in ride height of vehicles of categories MC, NA and NB1.
- Design that results in the total vehicle height being raised by no more than 150mm.
- Design that results in the total vehicle height being raised by no more than 75mm by modified suspension.
- Design that results in the total vehicle height being raised by no more than 25mm by larger tyres.
- Design that results in the total vehicle height being raised by no more than 50mm by body blocks.
- Design of front suspension modifications using different struts or uprights;
- Design of independent rear suspension modifications using different struts, trailing arms or uprights;
- Design of a conversion using a complete suspension assembly from a different vehicle model;
- Design of a complete rear suspension assembly using components from different vehicle model(s); and
- Alternative wheel and tyre specifications for vehicles with modified axles or suspension.

### **2.2 Designs not covered by Code LS9**

Note that vehicle lift designs that do not exceed 75mm above the original manufacturer's specifications, and are achieved only from a lift up to 50mm from modified suspension and/or lift up to 25mm from larger tyres and rims do not require certification.

The following is a summary of the designs NOT allowed to be certified under Code LS9:

- For all lift designs that require certification, if a vehicle is equipped with electronic stability control (ESC) system and the lift has not been approved by the vehicle

- manufacturer or proven through testing;
- Certification of the actual physical modification on a particular vehicle (this is covered by code LS10);
- Design of modifications that increase the ride height by (a) more than 75mm from suspension or (b) more than 25mm from tyres or (c) more than 50mm from body blocks or (d) more than 150mm combined from the original manufactured height;
- Design for modifications that raise the vehicle ride height more than 50mm from the original as-manufactured height on vehicles that have had the wheel track reduced from the as-manufactured width.

### 3. Compliance with applicable vehicle standards

Modified vehicles must continue to comply with the Australian Design Rules (ADRs) to which they were originally constructed, except as allowed for in the *Transport Operations (Road Use Management—Vehicle Standards and Safety) Regulation 2010* (the regulation). These modified vehicles must also comply with the applicable in-service requirements of the regulation. This is not an exhaustive list and other modifications may also affect ADR compliance.

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

Outlined below in Table LS9-2 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.

**Table LS9-2 Summary of items that, if modified, may detrimentally affect compliance with applicable ADRs**

DETAIL	REQUIREMENTS
Installation of Lighting	ADR 13/..
Braking System	ADR 7, 7/.., 31, 31/.., 35x, 35/..
Speedometer	ADR 18x, 18/..
Tyre Speed Rating	ADR 24x, 24/..
Ground Clearance	ADR 43/..

To determine the ADRs that apply to the vehicle in question, refer to the applicability tables in Section LO of the National Code of Practice: Light Vehicle Construction and Modification (NCOP). Vehicles manufactured on or after 1 January 1969 and prior to 1 July 1988 need to comply with the Second Edition ADRs whilst vehicles manufactured after 1 July 1988 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.

## 4. Specific Requirements

### 4.1 Vehicle lifts up to 150mm

The following requirements must be met for all vehicle lift modifications that do not exceed 150mm and require certification. Where a modification involves a change to the suspension system *design*, the basic functional requirements for suspension modifications/conversions are provided as a guide to suitably qualified and experienced signatories when designing or certifying such modifications or conversions.

The design should also comply with the general guidelines contained in sub-section 2 *General Requirements, Specific Requirements* in Code LS3 *Front Suspension and Steering Conversion – Design* and *Specific Requirements* in Code LS5 *Rear Suspension Modification – Design*, in the NCOP.

Each design should be fully documented, with drawings, calculations, procedural details, test results, wheel alignment specifications and any other data necessary to fully describe the vehicle modifications and should have a unique design number. The design document should contain:

- Details of all drawings needed to fully describe the full extent of the modification;
- Details of any special modification techniques, procedures or adjustments; and
- Details of any testing of components and performance (e.g. bump steer plots) with related acceptance criteria.

### 4.2 Suspension Modifications

The available suspension travel in either direction must remain at least equivalent to two thirds of that originally available prior to modifying the system.

The available suspension rebound following the addition of increased length coil springs and longer travel shock absorbers must be at least equivalent to two thirds of the original rebound travel.

The rebound must be limited by either the shock absorber maximum travel (providing the component is designed for this type of loading), the technique used by the original manufacturer's design or by the addition of adequately sized straps.

At full rebound the coil springs must still be securely attached to the vehicle by not having reached their free length.

All linkages and brake lines etc. must be adequately designed for the increased movement.

The increase in vehicle ride height due to suspension modifications must not exceed 75mm.

### 4.3 Body Blocks

Body blocks between the vehicle body and the chassis must comply with the following:

- The material must be of similar strength and durability as the original components;

- All assemblies and piping that spans between the body and the chassis must be suitable for the increased distance; and
- The increase in vehicle ride height due to body blocks must not exceed 50mm.

#### 4.4 Wheels and Tyres

The overall tyre diameter can be increased up to 50mm for vehicles of category MC, NA and NB1. This will increase the ride height up to 25 mm.

Tyres fitted to such vehicles (category MC, NA, NB1) must not be more than 50% wider than the vehicle manufacturer's widest optional tyre.

The rim width must match the recommendations for the tyre fitted.

The tables of original tyres with the maximum allowable tyre and rim sizes in Clause 4.2 *Non-Standard Tyres and Rims* in the NCOP are applicable.

The wheel track of MC, NA, NB1 category vehicles must not be increased by more than 50mm beyond the maximum specified by the vehicle manufacturer for the particular model.

The wheels must be contained within the bodywork or mudguards (including flares) when the wheels are in the straight-ahead position. Adequate clearance must be available between the tyres and the vehicle bodywork.

Speedometer accuracy must be maintained for the selected tyre and rim combination to within the degree of accuracy specified in the applicable ADR 18/...

#### 4.5 Brakes

Modifications to any of the brake circuitry should meet the requirements of Section LG *Brakes* in the NCOP.

The braking performance of the vehicle should also meet the requirements of Section LG *Brakes* in the NCOP.

#### 4.6 Vehicle Dynamics

These modifications, where the height of the centre of mass (centre of gravity) of an existing vehicle is increased, can have a significant influence on the handling/rollover characteristics of the modified vehicle. The height to which a particular vehicle can be safely raised is limited by the ability of that vehicle to safely negotiate conditions encountered in normal highway driving and under emergency situations. Vehicles certified under LS9 and LS10 must fully comply with the *Lane Change Test* as outlined in Section LT *Test Procedures* (Code LT2) in the NCOP.

While Code LS9 allows for an overall vehicle height increase of 150mm maximum, it is conditional upon the vehicle's ability to safely negotiate the lane change test as mentioned above.

#### 4.7 ESC Testing

In case of vehicles fitted with an ESC system, the ESC system must continue to perform as intended and must continue to comply with the ESC related standards, as applicable before the modification. Appropriate evidence of such continued compliance must be obtained and retained by the certifier. Apart from the ADR testing for ESC compliance

by a test facility that is approved by the National Association of Testing Authorities (NATA) or similar, the following other forms of alternative evidence may be accepted:

- (a) Vehicle manufacturer's approval letter or,
- (b) Recalibration of the ESC system by the original vehicle/system manufacturer (or authorised representative) or,
- (c) Combination of computer simulation and diagnostic testing by a recognised test authority or,
- (d) Any other form of evidence approved by the department.

#### **4.8 Vehicle Lighting**

The headlights must comply with the ADR requirements with respect to position and illumination pattern. For vehicles complying with ADR 13/00 the top of the headlamp lens must not be greater than 1200mm from the ground when measured on a level surface.

#### **4.9 Wheel guards (Mudguards)**

After all modifications are completed the wheel guards (mudguards) must continue to comply with the requirements of applicable ADR 42/...

#### **5.0 Components**

Both general and specific requirements specified in any codes of the LS section of the NCOP that are applicable to individual steering and suspension components continue to apply. Important items such as spline engagement, operating angles of drive shaft joints and in the case of CV joints, the range of axial movement, must remain within design limits for the full range of suspension travel. Also other components such as gear levers, brake hoses etc. may need to be extended depending on the nature of the lift.

Steering linkages must continue to operate efficiently and sufficient spline contact surface must be retained for the full range of suspension travel to ensure the safe operation of the vehicle.

Otherwise an appropriate steering shaft extension must be used.

Following the completion of modifications the vehicle attitude must remain as per original specifications – i.e. the original relationship between the front and rear suspension heights must not be changed and therefore the front and rear suspensions must be both raised by a proportionate amount.

## Checklist LS9

### High Lift – Up to 150mm (Design Certification)

#### CODE LS9

Form No: LS9

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

<b>Modification Certificate Number :</b>				
<b>1</b>	<b>Suspension Modifications</b>			
1.1	<b>Front Suspension and Steering</b>			
	Do the front suspension system modifications comply with all of the relevant requirements of Code LS3 in the NCOP?	N/A	Y	N
1.2	<b>Rear Suspension</b>			
	Do the rear suspension system modifications comply with all of the relevant requirements of Code LS5 in the NCOP?	N/A	Y	N
1.3	<b>Suspension travel</b>			
	Is the designed suspension travel at least two thirds of the original in all directions?	N/A	Y	N
	Has adequate rebound limiting been provided?	N/A	Y	N
	At full rebound do the coil springs remain securely attached to the vehicle by not having reached their free length?	N/A	Y	N
	Have all linkages and brake lines been designed to accommodate the increased suspension travel?	N/A	Y	N
<b>2</b>	<b>Body Blocks</b>			
2.1	<b>Mounting</b>			
	Are the replacement body blocks suitably designed to carry the load as per the vehicle's GVM?	N/A	Y	N
	When fitted, will the blocks lift the body no more than 50mm?	N/A	Y	N
2.2	<b>Design</b>			
	Are all assemblies spanning the body and chassis suitably designed to allow for the increased distance?	N/A	Y	N
	Are the body lift blocks suitably braced to the chassis or bodywork so as to prevent excess bending loads being placed on components?	N/A	Y	N

<b>3</b>	<b>Wheels and Tyres</b>			
3.1	<b>Tyres and Rims</b>			
	Are all selected tyres and rims in accordance with Section LS of the NCOP?	N/A	Y	N
	Is the increase in overall tyre diameter less than 50mm for MC, NA and NB1 category vehicles?	N/A	Y	N
3.2	<b>Speedometer</b>			
	Has the speedometer calibration been taken into account and adjusted as necessary?	N/A	Y	N
<b>4</b>	<b>Vehicle Dynamics</b>			
4.1	<b>Lane Change Test</b>			
	Has a vehicle undergone and passed a Lane Change Test as required by Code LT2 in the NCOP?	N/A	Y	N
	Was the driver satisfied that the vehicle was safe to drive?	N/A	Y	N
<b>5</b>	<b>ESC Testing</b>			
5.1	If the vehicle is fitted with an ESC system, is the modified vehicle assessed for continued compliance with ESC performance?	N/A	Y	N
5.2	Is the appropriate evidence of the continued compliance of the ESC system obtained and retained?	N/A	Y	N
<b>6</b>	<b>High Lift</b>			
6.1	<b>Maximum Increase in Vehicle Height</b>			
	Is the design total increase in vehicle height less than 150mm?		Y	N
	Is the top of the dipped beam headlight height less than 1200mm?		Y	N
	Does the dipped beam headlight pattern and position comply?		Y	N
6.2	Do the wheel guards (mudguards) continue to comply with the applicable ADR 42/...?		Y	N
<b>7</b>	<b>Brakes</b>			
7.1	Do the brake modifications comply with Section LG in the NCOP?	N/A	Y	N
7.2	Do the brakes meet the Section LG performance requirements in the NCOP?	N/A	Y	N
<b>8</b>	<b>Fasteners</b>			
8.1	Are high tensile bolts specified for all new critical mountings?		Y	N



8.2	Are self-locking nuts specified for all new critical mountings?		Y	N
8.3	Do all fasteners specified comply with the applicable requirements of Section LZ Appendices - Appendix A Fasteners in the NCOP?		Y	N
<b>9</b>	<b>Design</b>			
9.1	Does the design of the modification comply with all of the requirements outlined in Code LS9?		Y	N
9.2	Has all work, including welding, that has been specified in the certification of the LS9 design, been determined in accordance with recognised engineering standards and the relevant Appendices of Section LZ Appendices?		Y	N
9.3	Have all components affected by the lift such as gear levers, brake hoses etc. been modified to comply with Code LS9?	N/A	Y	N
9.4	Have all items affected by the lift such as drive shaft joint operating angles, spline engagement and axial movement of CV joints been checked or designed to be within design limits over the entire suspension travel?	N/A	Y	N
9.5	Has a detailed Design Approval Package (with unique identifier) been provided for use by the modifier and the LS10 certifier to carry out the physical modifications, tests and checks?		Y	N

**Note:** If the answer to any question is **N (No)**, the design cannot be certified under Code LS9.

# High Lift - Up to 150mm (Modification Certification)

## CODE LS10

Code LS10 applies to ADR category MC, NA and NB1 vehicles.

### 1. Introduction

LS10 code provides modification standards for lifting vehicle ride height by changes to suspension, tyres or body blocks on light vehicles of categories MC (Off Road Passenger Vehicle), NA (Light Goods Vehicle with GVM up to 3,500 kg) and NB1 (Medium Goods Vehicle with GVM up to 4,500 kg).

Increase ride height due to fitting of alternate tyre and rim that is permitted by the original vehicle manufacturer or otherwise permitted in the Code of Practice without certification is deemed as a **minor modification** and does not require certification.

Increase in ride height (a) up to 50mm due to modified suspension or (b) up to 25mm due to larger tyre or (c) up to 75mm due to combination of (a) and (b) is deemed as a **basic modification** and does not require certification, provided the modification is carried out according to the guidelines in this code and meets the intent of this code. This applies to both vehicles with and without an Electronic Stability Control (ESC) system.

Note that fitting of tyres with larger diameter increases ride height by half that amount. For example, tyres with 50 mm larger diameter increase ride height by 25 mm.

Increase in ride height more than what is stated above and up to 150mm is deemed as a **significant modification** and requires certification according to this code.

Increase in ride height (a) above 75mm due to modified suspension or (b) above 25mm due to larger tyre or (c) above 50mm due to body blocks or (d) above 150mm due to any combination is deemed as an **extensive modification** and requires specific approval from the Department of Transport and Main Roads.

### 2. Scope

Code LS10 covers modifications that result in a vehicle lift not exceeding 150mm.

The conversions must be carried out in conformity with designs certified under Code LS9 by an Approved Person accredited by the Department of Transport and Main Roads.

The Table LS10-1 below further clarifies when certification is not required and when it is required.

**Table LS10-1**

Vehicles with and without ESC

Certification	Suspension	Tyres	Body blocks	Total lift
Not required	up to 50mm	up to 25mm	0 mm	up to 75mm
Required	up to 75mm	up to 25mm	up to 50mm	up to 150mm

## 2.1 Modification covered under code LS10

The following is a summary of the modifications that are allowed to be certified under Code LS10, based on a relevant LS9 design certification:

- Increase in ride height of vehicles of categories MC, NA and NB1.
- Modifications resulting in total vehicle height being raised by no more than 150mm.
- Modifications that result in the total vehicle height being raised by no more than 75mm by modified suspension.
- Modifications that result in the total vehicle height being raised by no more than 25mm by larger tyres.
- Modifications that result in the total vehicle height being raised by no more than 50mm by body blocks.
- Modifications of front suspension using different struts or uprights;
- Independent rear suspension modifications using different struts, trailing arms or uprights;
- Conversion using a complete suspension assembly from a different vehicle model;
- Fitting of complete rear suspension assembly using components from different vehicle model(s); and
- Alternative wheel and tyre specifications for vehicles with modified axles or suspension.

## 2.2 Modifications not covered under code LS10

Note that vehicle lift designs that do not exceed 75mm above the original manufacturer's specifications, and are achieved only from a lift up to 50mm from modified suspension and/or lift up to 25mm from larger tyres and rims do not require certification.

The following is a summary of the modifications that are NOT allowed to be certified under Code LS10:

- Design of the modification of particular vehicles (this is covered by Code LS9);
- Modifications that do not have a design in accordance with the requirements of Code LS9 and a relevant and appropriate LS9 certification;
- Modifications that increase the ride height by (a) more than 75mm from suspension or (b) more than 25mm from tyres or (c) more than 50mm from body blocks or (d) more than 150mm combined from the original manufactured height.

## Checklist LS10

### High Lift – Up to 150mm (Modification Certification)

#### CODE LS10

Form No: LS10

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

<b>Modification Certificate Number :</b>				
<b>1</b>	<b>Design</b>			
1.1	Insert LS9 Design Approval Package Number.....( the Design)			
1.2	Has the vehicle been modified exactly in accordance with the plans and specifications issued under the LS9 Design Approval Package given above?		Y	N
1.3	If the vehicle was originally equipped with ESC, and if the modification affects the ESC, has the ESC system been assessed/tested and found to operate satisfactorily?	N/A	Y	N
<b>2</b>	<b>Vehicle condition prior to modification</b>			
2.1	Is the front suspension serviceable?		Y	N
2.2	Is the steering box serviceable?		Y	N
2.3	Is the steering linkage serviceable?		Y	N
2.4	Is the chassis serviceable?		Y	N
<b>3</b>	<b>Workmanship</b>			
3.1	Is all work, including welding, of satisfactory quality and has all work been performed in accordance with recognised engineering standards?	N/A	Y	N
3.2	Do all new or replaced fasteners comply with the applicable requirements of Section LZ Appendices, Appendix A Fasteners in the NCOP?		Y	N
3.3	Are high tensile bolts and self-locking nuts used on all critical joints and mountings?		Y	N
<b>4</b>	<b>Modification Details</b>			
4.1	What was the original height of the vehicle body prior to any modification?			
4.2	What is the height of the vehicle body following completion of all lift modifications			
4.3	Is the difference in heights less than 150mm?		Y	N
4.4	What is the largest size tyre on the tyre placard or in the owner's handbook for this vehicle?			

4.5	What size tyre has been fitted?			
4.6	Is the increase in overall tyre diameter less than 50mm for MC, NA and NB1 category vehicles or less than 15mm for other passenger vehicles?	N/A	Y	N
4.7	If the vehicle body has been lifted relative to the chassis, is the overall body lift 50mm or less?	N/A	Y	N
4.8	If the suspension has been modified to provide an increase in vehicle body height, is this increase 75mm or less?	N/A	Y	N
<b>5</b>	<b>Handling Dynamics Test (as specified by LS9 certification)</b>			
5.1	Has the vehicle undergone a Handling Dynamics Test as per LS9 certification?	Y		N
5.2	Did the vehicle pass the test satisfactorily?	Y		N
5.3	Is the driver satisfied that the vehicle is safe to drive?	Y		N
5.4	Is a copy of the handling dynamics test results form attached as required by LS9 certification?	Y		N
<b>6</b>	<b>Vehicle condition after modification</b>			
6.1	Is the front suspension serviceable?		Y	N
6.2	Is the steering box serviceable?		Y	N
6.3	Is the steering linkage serviceable?		Y	N
6.4	Is the chassis serviceable?		Y	N
6.5	Is the dipped beam headlight height less than 1200mm?		Y	N
6.6	Have the headlights been adjusted?		Y	N
6.7	Have all brake tests been satisfactorily completed?	N/A	Y	N
6.8	Is the combined height increase 150mm or less?		Y	N
6.9	Do the mudguards continue to comply as with applicable ADR 42/...?		Y	N
6.10	Have all components affected by the lift such as gear levers, brake hoses etc. been modified and fitted to comply with Code LS9?	N/A	Y	N
6.11	Have all items affected by the lift such as drive shaft joint operating angles, spline engagement and axial movement of CV joints been checked and found to be within design limits over the entire suspension travel?	N/A	Y	N

**Note:** If the answer to any question is **N (No)**, the modification cannot be certified under Code LS10.