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Supersedes: Nil

50

Raising and lowering vehicles

Status

The information provided in this Vehicle Standards Information (VSI) No. 50 supersedes that given in the *NSW Code of Practice for Light Vehicle Modifications* with respect to change of vehicle ride height. It is issued under the provisions of Clause 55(3)(b) of the Road Transport (Vehicle Registration) Regulation 2007 (the Regulation).

Purpose

This VSI is intended to advise vehicle owners, operators and persons registered as engineering signatories on the Road and Traffic Authority's (RTA's) Engineering Certificate System (ECS), of the requirements for raising or lowering vehicles from their originally designed and manufactured condition. Apart from minor wheel changes allowed in VSI No. 9 *Guidelines for alternative wheels and tyres*, it establishes that any raising or lowering of a vehicle from its original ride height is a *major modification*, and it limits the change in ride height of a vehicle intended to be used on roads or road related areas to ± 50 mm.

General requirements

The Regulation requires that a vehicle used on roads or road related areas in NSW conforms to the applicable vehicle standards for the vehicle, including all relevant Australian Design Rules (ADRs); and the vehicle and its parts and equipment are suitable for safe use and are in a thoroughly serviceable condition. There is a further requirement to keep a vehicle in good order so that it will not cause danger to any person. This means that a vehicle must be maintained in a manner that does not reduce the levels of safety it provides to its occupants or other road users. These requirements extend to modified vehicles, so modifications to vehicles must not lower their inherent safety characteristics or the safety of other road users, and must be in accordance with the other vehicle standards requirements of the Regulation, including conformance to all the relevant ADRs that applied to the vehicle when it was manufactured.

It is the responsibility of the vehicle's registered operator, who is usually the owner, to ensure conformance to these requirements. Failure to do so will render a vehicle outside the provisions of the Regulation, and it is illegal to register such a vehicle in NSW.

Raising or lowering a vehicle to alter its ride height is deemed to be a *major modification* from its original condition. There are a number of reasons that an owner or operator may choose to raise or lower a vehicle. Typically, these are: to gain additional under-chassis clearances for operational or recreational reasons; for a special need, such as improving access for a disabled passenger; or simply to alter its

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appearance for aesthetic purposes. This VSI No. 50 sets out the requirements for such modifications, and the limits to which a vehicle's suspension system can be modified.

A person intending to raise or lower a vehicle should seek the assistance of an engineering signatory prior to commencing the modification. Refer to VSI No. 15 for a list of engineering signatories.

Vehicles modified beyond the limits specified in this VSI No. 50 will not be registered for unrestricted use on roads and road-related areas in NSW.

Maintaining safety

Raising or lowering a vehicle requires altering its suspension. A vehicle's suspension is critical to its safe operation, and is designed to provide a safe and predictable performance under specified driving operations.

Modifying a vehicle's suspension by raising or lowering it beyond the manufacturer's specification has the potential to decrease its safety by compromising its handling and braking performance, affecting safety features, and by altering the position of impact-absorbing sections.

The safety of raised or lowered vehicles may be reduced in the following areas:

- **Dynamic stability** - Raising a vehicle correspondingly raises its centre of gravity, which increases its propensity to overturn.
- **Road handling capabilities** - In addition to the above, raising a vehicle's centre of gravity adversely affects its ability to manoeuvre, such as changing lanes and cornering.
- **Electronic stability control (ESC)** - ESC is an important safety feature that helps a driver retain control of a vehicle under extreme driving circumstances, such as cornering too quickly. ESC is specifically programmed by the manufacturer for a vehicle's particular configuration, and altering the ride height could affect this programming and negate the benefits of ESC.
- **Braking characteristics*** - Altering a vehicle's ride height by changing the tyres or wheel used can affect the braking system performance. In addition, the higher centre of gravity of a raised vehicle increases its moment of inertia which also affects its braking performance.
- **Ground clearance*** - Lowering a vehicle decreases its ground clearance, which could cause the under chassis to impact the ground when travelling on uneven or rough surfaces, or simply when driving over standard road features such as speed humps, culverts or kerbs.
- **Occupant protection*** - The design of a vehicle incorporates minimum specified levels of occupant protection that help safeguard persons travelling in the vehicle in the event of it crashing. This is usually achieved by the front and rear bumpers, crumple zones and by providing locally strengthened sections in the vehicle's structure. These are positioned at designated heights above the ground specifically to absorb the impact from another vehicle. Altering a vehicle's height correspondingly alters the position of these safety features, which may reduce the levels of protection the vehicle affords its occupants.
- **Risks to occupants of other vehicles** - In addition to the above, altering the position of a vehicle's bumpers means its point of contact with other vehicles may be above or below their bumpers, crumple zones and locally strengthened sections, thereby exposing their occupants to an increased risk of injury in the event of them crashing with a raised or lowered vehicle.
- **Risks to vulnerable road users** - Altering the position of a vehicle's bumpers changes its point of contact with vulnerable road users, such as pedestrians and cyclists, with a corresponding increase of greater risk or injury to them in the event of their being struck by a raised vehicle even at slow speeds. This risk is compounded if the vehicle has bull-bars fitted.
- **Risks to other road users** - A vehicle that is out-of-control poses a risk to other road users.
- **Driver's field of vision** - Altering a vehicle's ride height changes the driver's view of the road. When a vehicle is raised, the distance to the point the driver can see the ground in front of them is increased. This results in an increased blind zone immediately in front of the driver where they cannot readily see other road users, such as pedestrians, cyclists and smaller vehicles. Similarly, blind zones along the passenger side and rear of the vehicle are also significantly increased.

- **Unexpected vehicle behaviour** - A vehicle's suspension system involves complex relationships between its components. Modifications to some components can introduce unexpected consequences in the vehicle, such as introducing body roll induced wheel or axle steer and wheel angle while turning, all of which could significantly degrade the handling characteristics of the vehicle.
- **Impact on other components** - Modifications to ride height can stress or expose other components, such as brake hoses or ABS/ESC sensor wires, resulting in their premature failure.
- **Trajectory of headlights*** - Altering a vehicle's height alters the trajectory of its headlights, which could cause them to dazzle other road users either by shining directly in their eyes or by reflecting in rear vision mirrors.

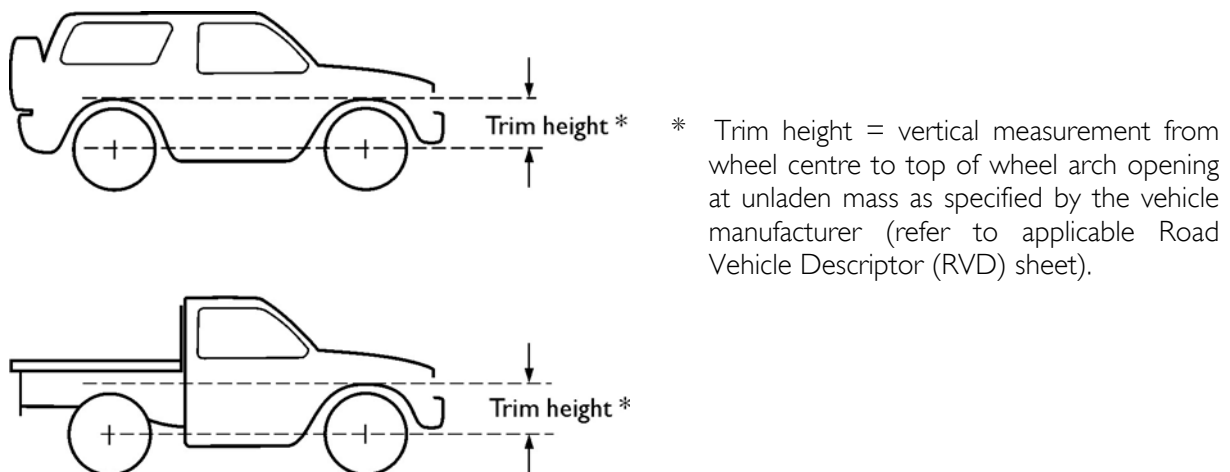
* There are specific ADRs applicable to these items.

Raising a vehicle

Vehicles intended to be registered for use on roads or road related areas in NSW may be raised to a maximum height of 50 mm above the original trim height as established by the vehicle's manufacturer (see Figure 1).

Vehicles raised more than 50 mm above the original trim height as established by the vehicle's manufacturer (see Figure 1) will only be conditionally registered in NSW and will have restricted access to roads and road related areas.

FIGURE 1: TRIM HEIGHT



Raising the height of a vehicle must be achieved by one of or a combination of the following:

- A suspension modification kit; extended shackles must not be used.
- A body or suspension lift kit, ie use of spacer blocks.
- Larger diameter rims and tyres. Where this option is used, the increase in overall tyre radius is added to the trim height to show the lift relative to the ground. Refer to 'Certification' on page 5 for particular requirements for increasing the overall diameter of the wheel and tyre combination by up to 15 mm.

Chassis rails must not be notched or cut to raise a vehicle's ride height.

Lowering a vehicle

The ground clearance of a fully laden vehicle must:

- Not be less than 100 mm within one metre of an axle (see Figure 2).
- Be at least one-thirtieth of the distance between centres of adjacent axles at the midpoint between them (see Figure 2).
- Allow the vehicle to pass over a peak in the road with the gradient on either side of 1:15 if the wheels of one axle of the vehicle are on the slope on one side of the peak and the wheels of the next axle are on the slope of the other side (see Figure 3).

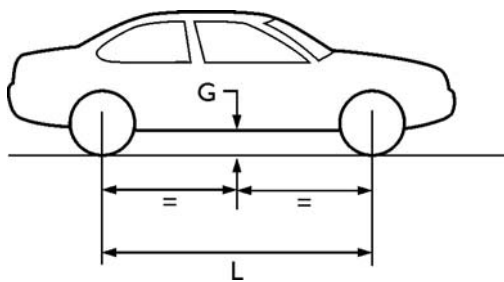
In addition, the running clearance (which is the distance from the surface on which an unladen vehicle is standing to the lowest point on the vehicle excluding unsprung mass) must not be less than 100mm.

Refer to 'Certification' on page 5 for particular requirements for lowering the ride height by reducing the overall diameter of the wheel and tyre combination by up to 15 mm.

Drop axles/spindles must not be used to lower a vehicle's ride height.

Chassis rails must not be notched or cut to lower a vehicle's ride height.

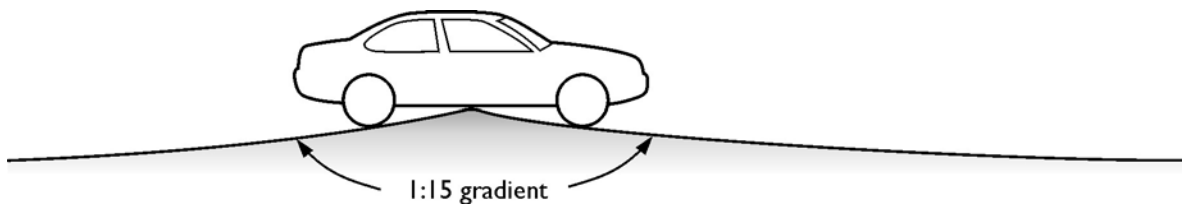
FIGURE 2: MINIMUM GROUND CLEARANCE



Ground clearance 'G' must be;

- A minimum of 100 mm within 1 metre of an axle, and,
- At least 1/30th of the distance between adjacent axles 'L'.

FIGURE 3: GROUND CLEARANCE OVER PEAK IN ROAD



Variable suspension height control (all vehicles)

Variable height suspension control systems used for both raising and lowering vehicles must conform to the following:

1. The vehicle must not be capable of being lowered so that it no longer satisfies the minimum ground clearance requirements described above.
2. The suspension height must only be capable of being altered when the vehicle is stationary.
3. The original relationship between the front and rear suspension heights and across an axle must not be changed. This requires that the front and rear suspensions must be both raised or lowered by the same amount and height adjustment across an axle by the same amount, unless evidence is provided that the vehicle is used for wheelchair access.

A statement of conformance must be provided as part of the certificate issued by the engineering signatory or manufacturer, or manufacturer's authorised dealer (see 'Certification' on page 5).

Certification

MINOR CHANGES TO WHEELS

Altering a vehicle's ride height by changing the outside diameter of the wheel and tyre combination by no more than 15 mm over the largest (for raising) or below the smallest (for lowering) combination specified by the vehicle's manufacturer is considered to be a *minor modification* and does not require certification. Refer to VSI No. 9 for more information on using alternative wheels and tyres.

Where such a change is made in combination with another alteration which further increases or reduces the ride height, the modification is considered to be *major* and is subject to the certification requirements outlined below.

OTHER CHANGES

A vehicle whose ride height has been modified must have a certificate stating that the modifications conform to the safety standards requirements specified in the Regulation, including conforming to the relevant ADRs, and that the safety levels of the modified vehicle, pertaining to both the vehicle's occupants and other road users, have not been reduced from its original condition.

For a vehicle that has been raised up to 50 mm in accordance with its manufacturer's specifications and using parts supplied by the manufacturer or equivalent parts, the certificate must be provided by the manufacturer or a manufacturer's authorised dealer, a person competent in such modifications or an engineering signatory.

For all other raised vehicles and all lowered vehicles the certificate must be provided by an engineering signatory.

How to register a raised or lowered vehicle

Once a vehicle has been raised or lowered, it must be checked by an Authorised Examiner at an Authorised Unregistered Vehicle Inspection Station (AUVIS) inspection, commonly referred to as a 'blue slip' inspection. This inspection will cover the design and installation of the components used in the modification, and include specific safety check requirements and verification of the certificate issued by the engineering signatory or manufacturer as appropriate. Once the vehicle has passed an AUVIS inspection, an 'Adjustment of Records' form must be completed and presented to an RTA registry for processing.

The registered operator of a vehicle found to have been raised or lowered without the certificates required by this VSI No. 50 or whose records have not been amended accordingly during an RTA inspection or on-road police inspection may be issued with a defect notice or have its registration suspended or cancelled.

Date of commencement

This VSI applies to vehicles modified or presented to an AUVIS after 31 July 2009.