



# LETTER OF THE LAW

ENGINEERING AND LEGISLATION WITH JOHN VARETIMIDIS

## SUSPENSION MODIFICATIONS

**S**uspension modifications are very common and although most owners of modified vehicles consider this modification straightforward, suspension modifications require careful planning and the right aftermarket components to ensure the correct relationship between the tyres and the road are maintained.

Minor suspension modifications such as fitting replacement aftermarket approved coil springs and shock absorbers, additional or up-rated anti-roll bars or fitting suspension components available from the manufacturer are all considered as 'owner certified' modifications. Minor modifications do not generally affect the basic geometry or load capacity of the suspension system.

Major modifications which may include replacement of the original suspension system, front or rear, with suspension components from another vehicle, changing suspension attachment points or crossmembers to locate the suspension or substantially altering the mass of the vehicle all require engineering certification.

All suspension modifications must be carried out by selecting approved suspension components that do not require any cutting, heating, bending or welding. All threaded fasteners for use in modifications must be at least equivalent to SAE Grade 5 or ISO Grade 8.8 and assembled to the vehicle or component manufacturer's torque settings.

Where replacement suspension components are to be fitted and frame reinforcements are required, the strength of the original frame and attachment points of the suspension components must be maintained. Advice should be considered where any reinforcements are likely to cause any stress concentrations.

Replacement suspension components must clear all other original vehicle components where applicable, which may include steering linkages, engine components or other subframes or crossmembers.

Suspension bush material should be replaced with OEM items where possible to maintain flexing of bushes under suspension articulation. Nolahane or urethane-based bushes should be used where single-plane movement takes place only. Where there is additional movement or articulation, high-density nolahane or urethane bushes may cause additional loading on pivot points and undue stresses will occur.

Aftermarket Watts linkages or adjustable Panhard rods are commonly used where ride height alterations have been carried out. These components are used for locating the axle in the lateral plane and should be mounted as close to the horizontal position when the vehicle is set at its design load. The attachment points for these components should not interfere with other adjacent vehicle components throughout complete bump and rebound travel.

Custom rear suspension systems such as four-link systems should be discussed with a recognised consulting engineer before work begins.

Alterations to vehicle ride height are limited to one-third of the original suspension travel set by the original manufacturer. Changes to the free spring lengths are acceptable provided the coil spring is retained in the spring seat at all times throughout full bump and rebound. All suspension replacement components should take into consideration the correct spring rates and damper settings to maintain a comfortable ride without affecting vehicle dynamics under braking and cornering forces.

Road-testing of a completed vehicle must ensure that all operating characteristics of ride, handling and steering are suited for the vehicle application. The vehicle must handle in a predictable manner to all persons of average driving ability.

## AIR SUSPENSION SYSTEMS

The use of pneumatic or air suspension systems is becoming more popular in production vehicles and in the aftermarket. Rules and regulations vary between states for compliance of air suspension systems, so it is mandatory that you enquire before purchasing or fitting air suspension components.

The type of vehicle to be fitted with air suspension and vehicle use must also be evaluated to ensure the original suspension system can be adapted to suit air suspension without any considerable modification.

Airbags must be compatible for the range of travel, the available area for fitting and load capacity. Selecting the correct airbags must take into consideration the overall maximum load capacity of the vehicle including passengers and luggage, which is commonly referred to as the gross vehicle mass (GVM).

The airbags must also be rated to operate under the maximum and minimum loadings – the correct ride height settings, including upper and lower limits and operate within the manufacturer's range of pressure settings.

The airbags must be securely retained within the suspension components and have operating clearance throughout complete suspension travel.

In most states a self-levelling system is mandatory to ensure that independent ride height changes are not permitted at each corner of the vehicle. Operation and controls for adjusting the ride height of the vehicle should not be readily accessible from the driver's seating position and operable while the engine is running or the vehicle is in motion.

All aftermarket or replacement air suspension components must be supplied by a recognised manufacturer or supplier and rated for automotive use on road-registered vehicles. Air hoses, valves and fittings must also be approved for automotive use and selected for the application.

It is critical that you consult a certified engineer before attempting any suspension modifications that are not owner certified. The abovementioned comments are only a guide and must be certified to ensure vehicle compliance. **SC**

