

## Air Cylinder Suspension Systems

### Background

LVVTA has recently become aware of some vehicles fitted with 'air cylinder' suspension systems (as distinct from 'airbag' suspension systems), which are of such a design that they do not comply with the basic suspension principles required by LVV Standard 195-00 (Suspension Systems). These systems are most commonly fitted to Honda cars, and use an air cylinder instead of an air bag.

There can be fundamental problems with the air cylinder design, which effectively replaces the original equipment strut or coil-over shock absorber. Some of these cylinders do not meet the requirements of LVV Standard 195-00 (Suspension Systems), primarily because some of the cylinder designs do not incorporate an effective shock absorber, and from an operational point of view, if the cylinders are filled with air at very high pressures, the cylinders will not allow any suspension movement.

*To the right is a photograph of a typical example of an air cylinder suspension unit.*



### Research

LVVTA's initial position on the subject of air cylinder suspension systems was that they could not be used in road-going applications.

However, after some research and discussion with LVV Certifiers and other industry experts who have had some involvement with this type of suspension setup, LVVTA have learnt that some air cylinder suspension systems in fact have hydraulic dampers incorporated within the body of the units, and other air cylinder suspension systems come with a valve that, when adjusted correctly, enables the cylinder to act in a similar manner to a shock absorber, damping the suspension's movement.

### Outcome

After a full review by the LVVTA Technical Advisory Committee, LVVTA have agreed that air cylinder suspension systems can be used under certain conditions, provided that an LVV Certifier is satisfied that a specified criteria have been met to ensure that a low volume vehicle's safe operation will not be compromised as a result of fitment of such a system.

With input from installers, LVV Certifiers, and the LVVTA Technical Advisory Committee, LVVTA has developed a set of requirements to allow the LVV certification of air cylinder suspensions systems.

## Requirements

When presented with a low volume vehicle fitted with an air cylinder suspension system, the LVV Certifier must confirm that:

1. the cylinder appears to be professionally-manufactured and of good quality; and
2. the cylinder is the correct size for the application; and
3. the system is manufactured by a reputable company that is professionally engaged in the manufacture of purpose-designed automotive suspension systems; and
4. the cylinder has external bump-stops, which on McPherson strut applications must be directly on the shaft, and in applications where the air cylinder is working with a double wishbone-type suspension, either on the shaft, or on the chassis or sub-frame, or on the suspension arm; and
5. there is documented evidence from the air cylinder manufacturer that satisfies the LVV Certifier that the cylinder is in fact fitted with an internal damping system (this is often an air dampening valve that when fitted and adjusted correctly will give an acceptable ride - the adjustment of this dampening valve is critical in getting the best quality ride possible); and



*To the right is a photograph of an example of an air cylinder dampening valve.*

6. the system is checked to make sure the speed at which it operates is not excessive (too fast and it can cause the vehicle to jump and cause excessive wear on suspension components - to limit the speed of operation, small air lines and valves need to be fitted); and
7. the system is not over-filled with compressed air to such an extent that there is insufficient suspension movement available to allow the safe operation of the vehicle; and
8. all other applicable requirements in the NZ Car Construction Manual (Chapter 6 pages 6-40 to 6-45) regarding air bag suspension systems are met, including the provision of a means to ensure against the ability to adjust the vehicle's ride height when the vehicle is moving, and that scrub-line requirements are met.

### ***In summary***

*As of June 1 2008, a vehicle owner may have an air cylinder suspension system fitted to his or her vehicle, provided that it is LVV certified to the requirements of this LVV Information Sheet, by a LV-1D authorised LVV Certifier who has experience with this type of suspension system.*

If you have any queries or require any further clarification relating to this Information Sheet, please feel to contact technical team in the LVVTA office on (04) 238 4343.