LOW VOLUME VEHICLE TECHNICAL ASSOCIATION Inc

Converting 4-wheel Drive Vehicles to 2-wheel Drive

Background:

The question is raised from time to time, as to whether the removal of transmission parts to convert a 4-wheel drive or All-wheel drive vehicle to 2-wheel-drive requires LVV certification. Vehicle users remove such parts for different reasons; sometimes through the high cost or a lack of availability of parts, and sometimes for other reasons.

One such instance was a Subaru WRX Impreza owner who had removed his front axles in an effort to obtain a WoF, as doing so disguised the fact that the car had a locked front diff and steering at low speeds with the drive axles in place was almost impossible.

This Information Sheet is intended to provide some clarification on which modifications to such vehicles require certification, and what should be looked for.

There are three distinctly different types of vehicle with 4-wheel drive, and the requirement for LVV certification differs for the three types. While we acknowledge that there may be other variations on these three general descriptions, we believe that with the information supplied in this LVV Information Sheet, a determination can be made by an LVV Certifier on what requirements should be applied.

The three different types of 4-wheel drive vehicles are detailed individually as follows.

Part-time 4-wheel drive vehicles with a solid or 'live' front axle:

Definition:

These are vehicles fitted with a solid or live front axle and suspension, and driver operated control-levers or adjustable hubs used to change between 4-wheel drive mode and 2-wheel drive mode. Such vehicles normally operate in 2-wheel drive mode, with the rear wheels driven. 4-wheel drive is usually only selected for off-road use.

Is LVV certification required?

The vehicle manufacturers' braking systems are designed to work efficiently in 2-wheel-drive mode as well as 4-wheel-drive. The removal of any of the drive-shafts or axles, in this case, to the front diff or front wheels will not affect the vehicle's braking performance, handling performance, or front wheel bearing or hub retention.

On this basis, there is no requirement for LVV Certification.

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Part-time 4-wheel drive vehicles with independent front suspension (IFS):

Definition:

These are vehicles fitted with an independent front suspension, and driver operated control-levers or adjustable hubs used to change between 4-wheel drive mode and 2-wheel drive mode. Such vehicles normally operate in 2-wheel drive mode, with the rear wheels driven. 4-wheel drive is usually only selected for off-road use.

Is LVV certification required?

The vehicle manufacturers' braking systems are designed to work efficiently in 2-wheel-drive mode as well as 4-wheel-drive. The removal of a drive-shaft, in this case, to the front wheels will not affect the vehicle's braking performance however the outer CV joints, ABS system, and wheel bearings and hubs may have been affected by the removal of axle shafts.

The removal of any components that connect or form part of the 4-wheel drive system, therefore, does require LVV Certification.

LVV certification inspection requirements:

- The primary inspection process for such a vehicle will involve a thorough brake performance test to satisfy the LVV Certifier that, despite the 4-wheel drive to 2-wheel drive conversion, the vehicle's braking performance is not compromised as a result of the conversion.

  Specific considerations to the braking assessment must include the following:

  ⇨ the application of the performance requirements of the LVV Braking Systems Standard 35-00(00) 3-cycle brake test; and

  ⇨ in the case of an ABS-equipped vehicle, the ABS may need to be disabled in order to correctly determine the suitability of the vehicle's braking characteristics; and

  ⇨ special attention will need to be paid to the front-to-rear brake balance, as there is considerable risk that there could be too much braking effort on either the front or rear wheels as a result of the removal of the drive-train components. The LVV Certifier may require a change to the vehicle's front to rear axle brake balance.

- The removal of part of the vehicle's 4-wheel drive system may affect the handling or acceleration characteristics of a vehicle, particularly that of a high-performance or turbocharged all-wheel drive vehicle, such as a Subaru Legacy or Mitsubishi Lancer. The LVV Certifier should assess the vehicle during road testing to ensure it handles and behaves in a safe manner during 'normal' use.

- A warning label must be attached in a position clearly visible to the vehicle operator advising of the 4-wheel drive system disablement, warning the driver that the vehicle may not handle as originally manufactured (ie differently to a 4-wheel drive equivalent). These warning labels are to be arranged for by the LVV Certifier.

- The front and rear hub assemblies on commonly-available 4-wheel drive equipped vehicles rely on the constant velocity (CV) joints being fitted and torqued up correctly to keep the bearings pre-loaded and secured onto the hub. The CV, by means of an oil seal, also provides a weather-proof seal for the wheel bearings and hub assemblies. It is critical to ensure that the CV joint remains correctly fitted into the hub, to ensure the bearings are correctly retained and sealed. A nut/bolt/washer combination is NOT acceptable as an alternative to a CV joint.

- In some cases the CV joint may have been modified, so as to remove the 'cup' section of the joint, giving a cleaner looking conversion. This is acceptable, provided that the strength and integrity of the main 'shaft' and 'clamping' (threaded, splined, and stepped) areas of the CV joint is not affected in any way through heat, or grinding.

- It is critical that if the vehicle is equipped with ABS, that the ABS ring is still in its correct location on the CV joint, and that the ring is secure.

- While in its original configuration, the inner CV joints are securely retained in place by a circlip, and the positive engagement of the axle shaft. With the axle shaft removed there is a risk of the inner CV joint popping out while under high load or RPM conditions. It is therefore advisable that the inner CV joint is removed, and a machined plug fitted to the gearbox, to eliminate the risk of gear oil being allowed to exit the gearbox.

- The above step of fitting a machined plug should also be carried out in the case of the rear wheel drive being disabled, where the front to rear driveshaft is being removed, leaving the tail shaft housing open.

<u>One exception:</u>

The exception to this rule is the removal of the drive shaft which connects the transfer case gearbox to the front diff. This driveshaft may be removed without the need for LVV Certification, however the remainder of the axle shafts and 4-wheel drive components must remain.

All-wheel drive vehicles:

<u>Definition:</u>

These vehicles, commonly referred to as all-wheel drive, are designed to operate in 4-wheel drive mode in all situations.

<u>Is LVV certification required?</u>

In this case it is a reasonable assumption that the vehicle manufacturer took into account that the front and rear axles are linked, and that there could be some transfer of braking effort through the drive-line by the full-time viscous coupling. Also, the outer CV joints, ABS system, and wheel bearings and hubs may have been affected by the removal of axle shafts.

The removal of any components that connect or form part of the all-wheel drive system, therefore, does require LVV Certification.

LVV certification inspection requirements:

The same inspection requirements that apply for 'part-time 4-wheel drive vehicles with independent front suspension (IFS)' apply to 'all-wheel drive vehicles'.

Finally:

At some time in the future, the modification threshold in the VIRM modification table will be amended to state that removal of components that convert part-time 4-wheel drive to 2-wheel drive does in some cases require LVV Certification.

If you have any queries or require any further clarification relating to this Information Sheet, please feel free to contact one of the technical team at the Wellington office on (04) 477 4372.

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