LVVTA Raised Four Wheel Drive Workshop

to be held on the 20th and 21st of October 2015

Venue: 21 Raiha Street, Porirua

Start Time: 10:00 am

Objective:

To establish the best way forward in terms of dealing with raised 4WDs, and will focus on determining the preferred method of stability assessment including how the preferred assessment process will work at the ground floor from the LVV Certifiers' perspective, and to agree on a series of technical requirements that will ensure a safe inspection process for all the typical modifications that are made to these vehicles.

The technical decisions made will ultimately form a series of technical requirements that will be incorporated as a separate section in LVV Standard 195 (Suspension Systems), and this in turn will form the basis of the requirements within the inspection form-set that the LVV Certifiers use to assess each raised 4WD that they LVV certify.

Reasons:

For some time now LVV certifiers have been asking for guidelines for inspecting and certifying raised four wheel drive vehicles. Four Wheel Drive enthusiasts are looking for consistency across New Zealand in certification outcomes, and LVVTA wants to ensure that an appropriate inspection process is being applied. Additionally, with the introduction of Electronic Stability Control (ESC) becoming mandatory on new class MC (4WD) vehicles from 1 July 2015 in New Zealand LVV needs to understand the impacts upon ESC systems from modifications.

Vehicles coming into New Zealand will be required to have ESC as follows:

- **all new** class MA, MB, MC and NA light passenger and goods vehicles certified for entry into service from **1 July 2015**
- **used** class MC vehicles (four-wheel-drive SUVs and off-road vehicles) inspected at the border from **1 March 2016**
- **used** class MA vehicles (passenger cars) with engine capacity greater than 2 litres inspected at the border from **1 March 2018**
- **all other used** class MA, MB and NA light passenger and goods vehicles inspected at the border from **1 March 2020**

The requirement to have ESC will not apply to some specialist vehicles, such as vintage, motorsport and scratch-built vehicles. This is consistent with other Land Transport Rules.

From 1 July 2015 all owners of vehicles fitted with ESC, no matter when they were imported, will need to ensure that their ESC is working. This will be checked at warrant of fitness inspections.

Issues to be discussed:

Stability

- Tip table test
- Accelerometer-based computer programs (phone app?)
- Static roll-over threshold
- Load Cell test
- Other Tests?

Suspension Lift

- Leaf Spring
- Coil Spring
- Torsion Bar
- Independent Suspension (Front and Rear)

Tyre Size (Diameter)

- Track change
- Diameter and amount of lift

Body Lift

- Size
- Area
- Material

Safety for other road users

- Collision/bumper impacts

One of the considerations to deal with is the question of how an LVV Certifier can establish a raised vehicle's original ride height.

Stability:

This is the single most important focus for the workshop, the outcome of this needs to be easily applied by the LVV Certifiers and may require a threshold put in that a vehicle with a particular roll centre may be OK to apply one test method, but as the boundaries are pushed there may be a requirement for a more extensive/costly solution.

Suspension:

Is the current VIRM threshold applicable to today's vehicles?

Springs and shock absorbers

- *the springs or shock absorbers are direct replacements, and*
- *replacement springs are contained within unmodified OE seats throughout full suspension travel, and*
- *replacement springs are self-retaining in their seats at full extension, without the use of non-standard devices such as wire-ties, straps, or external spring locators, and*
- *replacement springs have not been heated or cut, and*
- *springs and spring seats are not height adjustable by any means (unless OE), and*
- *replacement shock absorbers, including air-adjustable units, fit unmodified OE mountings, and*
- *suspension maintains sufficient travel for safe operation when fully laden, and*
- *suspension components maintain sufficient clearance from unmodified bumpstops when fully laden, and*
- *a minimum of 100mm ground clearance (unladen and without driver) exists below any part of the vehicle structure, or any steering, braking or suspension component[2], and*
- *the normal relationship between front and rear suspension height is not unduly affected.*

[2] *Does not include such items as exhaust pipes and exterior body panels that do not contribute to the structural strength of the vehicle.*

Blocks for leaf springs to adjust their ride height (up or down)

- *the suspension has not been raised by any other means, and*
- *the blocks are:*
  – securely fitted, and
  – constructed from metal, and
  – designed for the purpose, and
  – firmly seated over not less than the OE seat area, and
  – not more than 50mm in height.

The modification threshold was written prior to the introduction of Electronic Stability Control and therefore can't really be applied to an ESC-complaint vehicle. For the purpose of this workshop we need to put the current threshold to one side and evaluate the facts on today's vehicles and requirements.

Other issues around raised suspension:

- Suspension arm angles
- Panhard rod attachment location and strength
- Steering geometry
- Frontal Impact/Airbags Bumper position
- Bumpsteer
- Centre of Gravity/Stability
- Effect on ESC

- Effect on Brake proportioning (mechanical lever type off diff)
- Suspension mounting points, size, strength, position
- Should spacers be allowed to raise suspension? (not recommended?)
- Aftermarket/custom suspension arms, material, welding, size
- Steering Arms
- Ball Joints, Rod ends, Bushes

Wheels and Tyres:

Current VIRM threshold:

Aftermarket wheel fitments[1]

- *the wheels:*

  – are of a known and reputable brand, and

  – would be considered an appropriate fitment for the vehicle type by the wheel manufacturer, and

  – are not modified, and

  – do not have spacers or adaptors fitted.

- *the tyre tread:*

  – does not protrude beyond the unmodified original body panels (including unmodified factory-fitted mudguard extensions), or

  – protrudes beyond the unmodified original body panels, but is covered by aftermarket or modified mudguard extensions or modified body panels, and the track width has increased by no more than 25mm from OE.

[1] *The vehicle inspector may refer the vehicle to an LVV certifier if the inspector has reasonable concerns that the safety of the vehicle has been affected by an aftermarket wheel fitment.*

Tyre size changes

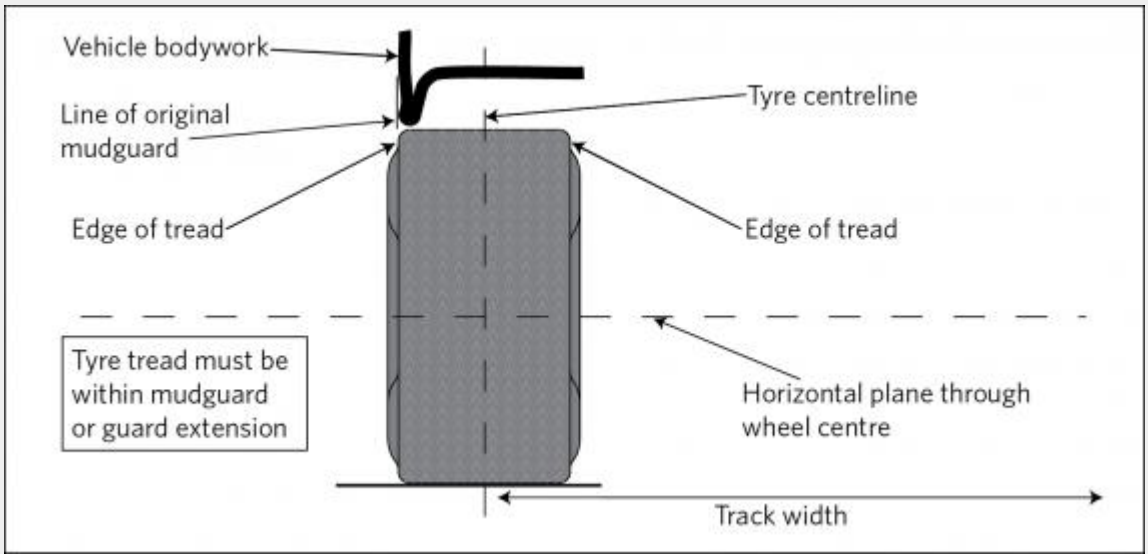
- *the tyres:*

  – have an outer circumference that is no more than 5% greater than OE, and

  – are an appropriate selection for rim width, and

  – have tread that does not extend beyond the original or modified body panels or guard extension (see Figure 10-1-1).

Figure 10-1-1. Tyre and body panel position



Issues around larger Diameter Wheels and Tyres:

- Centre of Gravity/Stability
- Increased track width?
- Frontal Impact/Airbags Bumper position
- Diameter/Raising Vehicle
- Wheel alignment
- Handling
- Guards
- Weight of wheel/tyre combination in relation to hub size, bearing size, stud size, suspension capability
- Weight of vehicle to hold wheel tyre combination to road/suspension capability (eg 44" tyre on a Hilux with triple shocks still couldn't hold an out of balance tyre to the road and vehicle didn't have the weight for the suspension to work against the weight of the wheel and tyre.)
- Impact on brakes
- Effect on ESC

Body Lift:

Current VIRM threshold:

There is currently no VIRM Threshold for Body lifts - **all body lifts require certification**

Issues around body lifts:

- Amount of lift in relation to body chassis stability (at 100mm the leverage on the mount is greatly increased and may require diagonal bracing or a greatly increased seat area and mounting attachment)
- Bolt or stud size and strength
- Area of spacers
- Material of spacers
- Retain OE mount?
- Steering shaft length
- Steering shaft angle. (Universal joints within spec, Not using a rubber coupling to allow direction change.)
- Steering shaft clearance (eg Hilux with over 50mm will cause intermediate shaft to rub on bulkhead)
- Brake hose length
- Proportioning valves (Mechanical valve with link from body to diff)
- Lighting
- Frontal Impact/Airbags Bumper position
- Centre of gravity/Stability
- Driver Vision/Visibility angles of road
- Effect on ESC
- Mudflaps/Guards

Safety for other road users:

- Impact point in a crash from raised vehicle
- Bumper heights

Options for moving forward:

Issues surrounding the effect of more than one method to raise vehicle:

- Does there need to be a maximum height put on total lift by any single lift (eg just suspension, or wheels and tyres, or body lift)?
- Does there need to be a maximum height put on combined lifts?
- If vehicle is raised should wheel track be increased proportionally
- Should there be a maximum VIRM threshold for Wheels and Tyres, Suspension or Body Lift?
- If yes too any above should there be a maximum combined VIRM threshold if suspension and wheels and tyres are changed?

Time Allowing:

Discussion on:

- Driveshaft Hoop requirements for addition of turbo and suitability for 4WD vehicles
- Beadlock Rims, aftermarket approved wheels?

For questions or comments, please contact:

Ken McAdam

Post:	P.O Box 50-600 Porirua
Street Address:	21 Raiha Street, Porirua
Phone:	(04) 238-4343
Email:	ken@lvvta.org.nz
