

Low Volume Vehicle Technical Association Incorporated
Low Volume Vehicle Standard
35-00(02)
(Braking Systems)

This Low Volume Vehicle Standard corresponds with: Land Transport Rule 32014 (Light Vehicle Brakes)

2nd Amendment – effective from: 25 October 2016

Signed in accordance with clause 1.5 of the Low Volume Vehicle Code, on.....by:	
<i>on behalf of the New Zealand Transport Agency:</i>	<i>on behalf on the Low Volume Vehicle Technical Association(Inc):</i>

LVV Standard 35-40 Amendment Record:

No:	Detail of amendments:	Version:	Issue date:	Effect date:
1	Initial issue – original version	35-00(00)	1 December 2000	1 December 2000
2	1 st Amendment	35-00(01)	1 July 2016	1 July 2016
3	2 nd Amendment	35-00(02)	25 October 2016	25 October 2016
4				
5				

Note that highlighted text shows amendments that have been made subsequent to the document’s previous issue, and a grey vertical stroke to the left of the text denotes information that is of a technical (rather than a formatting) nature.

Overview

Background

The Low Volume Vehicle Technical Association Incorporated (LVVTA) represents ten specialist automotive groups who are dedicated to ensuring that vehicles, when scratch-built or modified, meet the highest practicable safety standards. The information in these standards has stemmed from work undertaken by LVVTA founding member organisations that commenced prior to 1990 and has been progressively developed as an integral part of NZ Government safety rules and regulations by agreement and in consultation with the New Zealand Transport Agency. As a result, the considerable experience in applied safety engineering built up by LVVTA and the specialist automotive groups over the past twenty years can be of benefit to members of the NZ public who also wish to build or modify light motor vehicles.

Availability of low volume vehicle standards

Low volume vehicle standards are developed by the LVVTA, in consultation with the New Zealand Transport Agency, and are printed and distributed by the LVVTA. The standards are available to the public free of charge from the LVVTA website; www.lvvt.org.nz

Further information on the availability of the low volume vehicle standards may be obtained by contacting the LVVTA at info@lvvt.org.nz.

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Associated information

Other associated information relevant to the subject matter contained in this low volume vehicle standard, which in the interest of comprehensiveness, should be read in conjunction with this standard, includes:	
Document	Page #/Section/Chapter
• LVVTA News June-September 2013 Issue 47	Page 7 Brake Hoses Don't Require Standards Markings
• LVVTA News June-September 2013 Issue 47	Page 7 Brake Pedal Design and Construction
• LVVTA News January-July 2014 Issue 49	Page 8 Welded Multi-piece Brake Pedals
• LVVTA News August-December 2014 Issue 50	Page 5 Disability Vehicle Brake Testing – Relaxation of Requirements
• LVVTA News August-December 2014 Issue 50	Page 6 Hydraulic Brake Conversions on Early Fords
• LVVTA News August-December 2014 Issue 50	Page 9 CPP-brand Brake Boosters
• LVVTA News May-July 2015 Issue 52	Page 6 Multi-piece Brake Caliper Mounts
• LVV Information Sheet # 04-2007	Stainless Steel Braided Brake Hoses

<ul style="list-style-type: none"> NZ Car Construction Manual 	Chapter 8 Braking Systems
<p>Note that all documents referred to in this table, with the exception of the NZ Car Construction Manual, can be accessed from www.lvvta.org.nz free of charge. For information on obtaining the NZ Car Construction Manual, contact info@lvvta.org.nz</p> <p>Note also that paper copies of documents can become out of date and as such should not be relied upon, therefore LVVTA advises users of this standard to check to ensure that the Associated Information listed here is current, by going to www.lvvta.org.nz/standards.html</p>	

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Braking Systems

(185-40[02])

Purpose of this standard

The purpose of this low volume vehicle standard is to specify requirements for braking performance, in order to ensure efficient and consistent brake operation under all normal and emergency driving situations.

Section 1 Scope and application of this standard

1.1 Scope of this standard

1.1(1) This low volume vehicle standard applies to all light vehicles other than those specified in 1.1(2), that are:

- (a) modified on or after 1 January 1992 in such a way that the vehicle's braking performance may, directly or indirectly, be affected; or
- (b) scratch-built on or after 1 January 1992.

1.1(2) This low volume vehicle standard does not apply to:

- (a) powered bicycles of Class AB; or
- (b) light trailers of Class TA or TB; or
- (c) those vehicles specified in *section 4*.

1.2 Application of this standard

1.2(1) A light vehicle that is modified or scratch-built as in 1.1(1), becomes a low volume vehicle, and must:

- (a) be certified in accordance with the procedures specified in *chapter 2* of the *Low Volume Vehicle Code*; and
- (b) unless *section 3* applies, comply with all applicable technical requirements contained in *section 2* of this standard.

NOTE: Where a light vehicle is required to be certified to the *Low Volume Vehicle Code*, but the modification date precedes the date upon which this standard takes effect (1 December 2000), an LVV Certifier must ensure that the vehicle meets the general safety requirements contained in 2.1 of this standard, and should use the applicable technical requirements of *section 2* of this standard as a guideline upon which to base his judgements on the safety of the vehicle.

Section 2 Technical requirements of this standard

2.1 General safety requirements

2.1(1) A low volume vehicle must:

- (a) be designed and constructed using materials and components that are fit for their purpose; and
- (b) be safe to be operated on the road.

NOTE: The requirements specified in 2.1(1) are selected from 2.3 of Part 2 of the *Low Volume Vehicle Code*, reproduced here in the interest of convenience, and are over-riding requirements which make it clear that, regardless of what technical requirements are or are not in place, every vehicle certified to the *Low Volume Vehicle Code* must be fit for its purpose, and must be safe.

General service brake requirements

2.1(2) All low volume vehicles, except those specified in *section 3*, must comply with the following general safety requirements:

- (a) a service brake must be able to be applied in a controlled and progressive manner, and
- (b) a brake must be easily adjustable to compensate for wear and must be maintained in good condition and efficient working order; and
- (c) the friction surfaces of a brake must be within safe tolerance of their state when manufactured and must not be scored, damaged or weakened to the extent that the safety performance of the brake is adversely affected; and
- (d) the ovality and diameter of a brake drum must be within the service limits set by the vehicle manufacturer or the brake manufacturer, and
- (e) the runout and thickness of a brake or brake disc must:

- (i) be within the service limits set by the vehicle manufacturer or the brake manufacturer; and
- (ii) in the case where the limits are not known, the thickness must not be less than 90% of the original thickness;

and

- (f) the braking effort on each braked wheel of a vehicle must be in proportion to the load carried by that wheel, except when an anti-skid or stabilising device varies any braking effort to any wheel independently of the driver; and
- (g) when a low volume vehicle’s brake is applied:
 - (i) the vehicle or its controls must not vibrate to the extent that control of the vehicle is adversely affected; and
 - (ii) the braking effort on each braked wheel of the vehicle must provide stable and efficient braking without adverse effect on the directional control of the vehicle; and
 - (iii) in the case of a vehicle equipped with an anti-lock braking system, the vehicle’s wheels must not lock, other than when the speed of the vehicle falls below the anti-lock braking systems activation parameters of the manufacturer;

and

- (h) if a low volume vehicle is fitted with a warning system that is part of, or associated with, the use of a brake component or system, that warning system must function correctly.

NOTE: The requirements specified in 2.1(2) are the applicable general safety requirements from 2.2 of *Land Transport Rule 32014 Light Vehicle Brakes* (slightly amended for consolidation) which are required as part of this low volume vehicle standard, and are reproduced here in the interest of convenience.

2.2 Technical requirements for braking systems

2.2(1) All low volume vehicles, except those specified in section 3, must comply with the applicable requirements in 2.2 and 2.3.

Discs and drums

2.2(2) Brake disc and drum assemblies incorporated in a low volume vehicle must:

- (a) be compatible with the weight and performance potential of the vehicle to which they are fitted; and
- (b) incorporate braking surface swept area in accordance with the specifications contained in Chapter 8 Braking Systems of the New Zealand Car Construction Manual; and
- (c) utilise donor disc or drum material of a thickness that is not machined beyond the specifications of the brake component manufacturer.

2.2(3)

Where brake disc adaptations have taken place, the adaptation must not incorporate:

- (a) any welding, heating, or bending to any cast or forged suspension upright or stub axle, or steering arm; or
- (b) any reduction of the spindle diameter by machining or any other means; or
- (c) any alteration to the original radii contained on the spindle.

2.2(4)**Master cylinders**

A dual-circuit master cylinder system must be fitted to:

- (a) all scratch-built low volume vehicles; and
- (b) all modified production low volume vehicles which are fitted with any master cylinder other than that fitted by the original vehicle manufacturer.

NOTE: A braking system may incorporate twin single-circuit master cylinders rather than one dual-circuit master cylinder, provided that the relevant requirements of Chapter 8 of the New Zealand Car Construction Manual are met.

2.2(5)

A master cylinder reservoir fitted to a low volume vehicle must:

- (a) have a greater hydraulic fluid capacity than the combined total volume of all cylinders operating within the system; and
- (b) be readily accessible to inspect and fill with fluid.

2.2(6)

A relocated or remounted master cylinder must be:

- (a) located on a part of the vehicle structure with sufficient strength and rigidity to securely attach the cylinder, and support the cylinder during application of all normal and emergency braking loads; and
- (b) positioned so as to be no closer than 50 mm to any part of the vehicle exhaust system, unless protected by a suitable heatshield.

2.2(7)

An adjustable balance-bar assembly which actuates twin master cylinders must:

- (a) be capable of being securely locked into position to prevent unintended changes in front-to-rear brake balance; and
- (b) in the case of balance bar rods within a custom-built balance-bar assembly, be manufactured from a material of:
 - (i) appropriate strength; and
 - (ii) suitable diameter;

and

- (c) incorporate sufficient restriction of the angular movement of the balance bar so that one circuit continues to operate when the other circuit is inoperative for any reason, such as loss of fluid; and
- (d) meet the relevant requirements contained in *Chapter 8 Braking Systems* of the *New Zealand Car Construction Manual*.

Vacuum servo systems**2.2(8)**

A vacuum servo system fitted to a low volume vehicle must provide and maintain sufficient vacuum to enable the braking system to operate safely at all engine speeds including idle.

2.2(9)

A remote vacuum servo fitted to a low volume vehicle, if exposed to or fitted near the road surface, must be protected by a chassis or sub-frame member, or purpose designed shield, from damage by irregular road surfaces or debris.

2.2(10)

A vacuum brake hose used on a low volume vehicle must:

- (a) be of a type purposely designed for automotive applications; and

- (b) incorporate a one-way check valve to prevent unintended loss of vacuum whilst the engine is not running.

Brake pedal assemblies

2.2(11)

A brake pedal assembly used within a low volume vehicle must incorporate:

- (a) an effective return spring; and
- (b) a positive return stop; and
- (c) an acceptable amount of free pedal movement before the braking system is actuated.

2.2(12)

A relocated or remounted OEM brake pedal assembly must be located on a part of the vehicle structure with sufficient strength and rigidity to securely attach the assembly and support the assembly during application of all normal and emergency braking loads.

Manufacture and modification of components

2.2(13)

A modification to a brake system component, including a brake pedal or a brake pedal push-rod, or the custom-manufacture of a brake pedal or brake pedal push-rod used, within a low volume vehicle must meet the requirements specified in *Chapter 8 Braking Systems* of the *New Zealand Car Construction Manual*.

Hydraulic brake pipes

2.2(14)

A hydraulic brake pipe and its attachment system fitted to a low volume vehicle must be of a type purposely designed for automotive applications.

2.2(15)

A non-flexible hydraulic brake pipe fitted to a low volume vehicle must:

- (a) follow the shortest practical route; and
- (b) be connected using double or ball flares; and
- (c) be securely fastened to the vehicle structure at intervals of either:
 - (i) that originally utilised by the vehicle manufacturer; or
 - (ii) no further apart than 300 mm;

and

(d) be manufactured from either:

(i) steel bundy tubing; or

(ii) copper-nickel tubing.

2.2(16)

A hydraulic brake pipe fitted to a low volume vehicle must be mounted in such a position so as to be:

- (a) protected from being damaged by curbs, irregular road surfaces, or jacking equipment; and
- (b) away from any moving components within the engine compartment; and
- (c) able to be visually inspected without being removed; and
- (d) protected from any chafing or abrasion where a hydraulic brake pipe passes through a rigid section of vehicle structure; and
- (e) provided with sufficient flexibility in the case where a hydraulic brake pipe bridges across a rubber mounted body/chassis junction; and
- (f) unless protected by a suitable heat-shield:
 - (i) not less than 50 mm from any part of the vehicle's exhaust system; and
 - (ii) not less than 100 mm from a catalytic converter (if fitted).

2.2(17)

A hydraulic brake pipe which is mounted adjacent to any drive-shaft in a low volume vehicle which has been modified in such a way that results in substantially increased power output must;

- (a) be re-directed away from the vicinity of the drive-shaft; or
- (b) be protected in the event of a drive-shaft failure by a 360-degree safety loop at each end of the drive-shaft, positioned within 150 mm of each drive-shaft universal pivot centre.

Hydraulic brake hoses

2.2(18)

A hydraulic brake hose and its attachment systems fitted to a low volume vehicle must be of a type purposely designed for automotive applications.

2.2(19)

A hydraulic brake hose fitted to a low volume vehicle must be attached and located in such a way so as not to be able to:

- (a) come into contact with any moving parts such as wheels, tyres, brake or suspension components; or
- (b) become caught or pinched between suspension spring coils; or
- (c) unless protected by a suitable heat-shield:
 - (i) not less than 50 mm from any part of the vehicle's exhaust system; and
 - (ii) not less than 100 mm from a catalytic converter (if fitted).

2.2(20)

Hydraulic brake hoses must be located and attached to a low volume vehicle in such a way that they are not fully extended, or under tension or excessive torsion at, or at any combination of, upward or downward suspension travel, or full steering lock.

2.2(21)

A hydraulic brake hose must not be used to replace a rigid brake pipe, except in the case where stainless steel braided hoses are installed in a low volume vehicle that has been issued with a current and valid LVV Authority Card which records 'braided flexible brake lines'.

NOTE: An 'LVV Authority Card' as referred to in 2.2(21) is an authority card issued by Motorsport New Zealand for authorised competition licence-holders.

2.2(22)

A stainless steel braided hose installed in a low volume vehicle, other than one specified in 2.2(21) must:

- (a) meet the requirements specified in 2.2(18) to 2.2(20) of this standard; and
- (b) be manufactured in such a way that it cannot be disassembled by hand tools; and
- (c) be fixed rigidly at each end; and
- (d) not cause sponginess in the brake pedal.

Braking bias systems

2.2(23)

A low volume vehicle may be fitted with one or more proportioning valves which are purposely designed for automotive applications.

2.2(24)

A proportioning valve which is adjustable from inside a vehicle must have the facility to be temporarily disabled or locked into a position of normal operation to prevent unintended changes in front to rear brake balance occurring whilst the vehicle is being operated on public roads.

Anti-lock braking systems

2.2(25)

A modified production low volume vehicle originally fitted by the vehicle manufacturer with an anti-lock braking system may be converted to a non anti-lock braking system, provided that:

- (a) the vehicle is provided with a warning label permanently positioned so as to alert the driver that the vehicle is longer equipped with an ABS system; and
- (b) the vehicle has any warning lights, decals, or badges originally installed by the vehicle manufacturer to indicate the presence of an ABS system removed or de-activated; and
- (c) all parts of the braking system which are unique to ABS and are relevant to the safe operation of the braking system without ABS are removed, and are either:
 - (i) replaced with the relevant parts from a non-ABS fitted variant of the same make and model; or
 - (ii) the system is modified to a non-ABS configuration using purpose-built braking components;

and

- (d) documentation in a form specified by the Low Volume Vehicle Technical Association Incorporated, verifies that 2.2(25)(c) has been complied with.

2.2(26)

A scratch-built low volume vehicle incorporating anti-lock braking must utilise a complete system from one make and model of donor vehicle, installed in the same way as originally installed to the donor vehicle by the original vehicle manufacturer.

Parking brake systems

2.2(27) A low volume vehicle must be fitted with a park brake system that operates on at least one axle.

2.2(28) A low volume vehicle must not be fitted with a hydraulically-operated parking brake system, except in the case where such a system is installed in a low volume vehicle that has been issued with a current and valid LVV Authority Card which records 'hydraulic handbrake assembly'.

NOTE: An 'LVV Authority Card' as referred to in 2.2(28) is an authority card issued by Motorsport New Zealand for authorised competition licence-holders.

2.2(29) A parking brake lever assembly fitted to a low volume vehicle must be located and attached onto a part of the vehicle structure sufficiently strong to securely attach the parking brake lever assembly.

2.2(30) A parking brake cable fitted to a low volume vehicle must:

- (a) be positioned or protected from being contacted by any moving parts of the vehicle; and
- (b) be securely fastened.

2.2(31) Modifications to a parking brake cable fitted to a low volume vehicle must be carried out by suitably experienced professionals using components and attachment methods purposely designed for parking brake applications.

2.2(32) A low volume vehicle must not be fitted with a cardan-shaft parking brake system unless the vehicle is equipped with a dual circuit service brake system.

NOTE: Only a low volume vehicle originally manufactured prior to 1 January 1990 that retains the original vehicle manufacturer's cardan-shaft parking brake system may retain the original vehicle manufacturer's single circuit brake system. This is because, unlike a normal park brake system, a cardan-shaft parking brake system cannot fulfil the requirement of an 'emergency brake' due to probable damage to the system if applied at speed.

2.2(33) A low volume vehicle must not be fitted with a hand-operated park brake that does not have a ratcheting engagement system

2.2(34) An electrically-operated parking brake system that has been retro-fitted to a low volume vehicle must:

- (a) only be applied or released when the vehicle's automatic transmission is in 'Park'; and

- (b) be operated through a load-sensing device such as a current draw sensor; and
- (c) be identified by a flashing light or similar warning device when the brake is applied; and
- (d) remain applied in the event of a short circuit or power loss.

Other requirements

2.2(35) All components used within a braking system on a low volume vehicle must be purposely designed for automotive applications.

2.2(36) A low volume vehicle manufactured after 1 December 1951 must be fitted with a speedometer, which provides an accurate indication of the vehicle's speed, and is clearly visible to the driver in a normal seated position.

NOTE: 'Accurate indication of the vehicle's speed' as required by 2.2(36) means that a speedometer must never indicate a speed lower than the actual speed nor indicate a speed more than 10% greater than actual speed. For example, at a true 100 kph the speedometer must indicate between 100 and 110 kph. This requirement is necessary in order to enable accurate service brake performance-testing.

2.2(37) All fasteners incorporated in high load or critical locations on vehicles which undergo braking system modifications or adaptations, must:

- (a) be either:
 - (i) the original fasteners supplied by the original vehicle manufacturer; or
 - (ii) of an appropriate size for the application;

and

- (b) must meet all applicable requirements in sections 18.2 to 18.6 of Chapter 18 Attachment Systems of the [New Zealand Car Construction Manual](#); and
- (c) in the case of brake caliper attachments, must not incorporate nyloc nuts.

2.3 Brake performance requirements

Service brake test requirements

2.3(1) A low volume vehicle must be fitted with a service brake system that:

(a) operates on all road wheels; and

(b) enables:

- (i) braking effect to occur with a pedal force of 6.6 kilograms; and
- (ii) maximum braking effect to be achieved with a pedal force of no more than 68 kilograms.

2.3(2)

A low volume vehicle must undergo a performance brake test as specified in 2.3(3), during which it must:

(a) be conducted:

- (i) on a hard level road surface that is free of loose material; and
- (ii) using sufficient acceleration between brake stops that is appropriate to the performance potential of the vehicle; and
- (iii) without the deliberate aid of engine compression;

and

(b) achieve whilst undergoing the test process:

- (i) smooth progressive braking performance; and
- (ii) no significant premature lock-up at either the front or the rear of the vehicle; and
- (iii) no significant imbalance between the left and right sides of the vehicle.

NOTE 1: The requirement for a sufficient level of acceleration between brake stops is in recognition that a vehicle with greater acceleration potential will reach 100 kph in a shorter time, leaving less time for the brakes to cool between each cycle and increasing the risk of brake fade due to heat build-up that accrues as a result of the reduced cool-down time.

NOTE 2: A low volume vehicle must be in good running order to be able to exhibit the vehicle's true performance potential.

2.3(3)

The performance that a braking system in a low volume vehicle must achieve is:

- (a) in the case of a modified production low volume vehicle which has attained an increase in engine power output from the original vehicle manufacturer’s specifications of between 20% and 50%, or have any modifications to the service brake system, or have any modifications which result in a change in or relocation of weight or centre of gravity:
 - (i) 3 consecutive cycles from 100 kph to standstill each at an average deceleration of not less than 0.65g; and
 - (ii) within a total time of 2 minutes from the start of the first cycle to the completion of the third cycle;

or

- (b) in the case of a scratch-built low volume vehicle, or a modified production low volume vehicle which has attained an increase in engine power output from the original vehicle manufacturer’s specifications of more than 50%:
 - (i) 5 consecutive cycles from 100 kph to standstill each at an average deceleration of not less than 0.65g; and
 - (ii) within a total time of 3 minutes from the start of the first cycle to the completion of the fifth cycle.

NOTE: An average deceleration of 0.65g from 100 kph to zero equates to a stopping time of 4.4 seconds, or a distance of 61 metres.

2.3(4)

A low volume vehicle tested in accordance with 2.3(3)(a) must be retested against the requirements specified in 2.3(3)(b), if the vehicle either:

- (a) exhibits during the test any significant increase in brake-fade between cycles; or
- (b) has, in the opinion of the certifier, braking componentry which may not be of sufficient durability relative to the performance potential or mass of the vehicle.

2.3(5)

In addition to the testing process specified in 2.3(3), a low volume vehicle must also achieve a single emergency braking test from a speed of 30 km/h to standstill, during which the vehicle must not exhibit any uneven wheel lockup or imbalance during the test.

NOTE: The single emergency stop test is required in order to identify any imbalance in the brakes that would not be evident in several controlled stops from 100 km/h, where brake lockup is deliberately avoided.

2.3(6) A low volume vehicle that is fitted with a hand-operated service brake for a person with disabilities must be able to be braked no less effectively with the hand-control than with the original foot control.

Parking brake test requirements

2.3(7) The parking brake system fitted to a low volume vehicle must be capable of either:

- (a) holding the vehicle in a stationary position without any assistance from the service braking system or transmission on a gradient of one in five; or
- (b) alternatively, on vehicle types for which such a test is appropriate, bringing the vehicle from a speed of 30 kph to a stationary position within a distance of 18 metres

2.4 Other requirements for braking systems

2.4(1) A low volume vehicle that features modifications which are not specifically covered within this standard must meet the applicable requirements of *Chapter 8 Braking Systems* of the *New Zealand Car Construction Manual*.

Section 3 Exclusions to this standard

3.1 Service brake-testing exclusions

Cyclic brake-testing exclusion

3.1(1) A modified production low volume vehicle that features minor modifications such that there cannot be any reduction of the braking system's ability to resist fade is not required to undergo multiple brake test cycles as specified in 2.3, and may instead undergo a one-off brake test, conducted to the same requirements specified in 2.3, provided that:

- (a) the modifications present on the vehicle are limited to:
 - (i) adjustable suspension with similar ride heights to the vehicle's original specification; and

(ii) wheels and tyres that fall within the certification threshold specified in 4.3 and 4.4 of *Low Volume Vehicle Standard 205-00 (Wheels and Tyres)*;

and

(b) the vehicle has no increase in engine performance; and

(c) there has been no significant weight or balance of weight change; and

(d) form-sets *FS011 (Modified Suspension Systems)* and *FS023 (Wheels & Tyres)* have been completed.

NOTE 1: The exclusion 3.1(1) is intended to apply to a modern vehicle with adjustable suspension that is set to a height that is similar to original, with no other modifications aside from aftermarket alloy wheels that are under the certification threshold. Such vehicles which are commonly-imported, feature these common modifications made in Japan.

NOTE 2: The exclusion in 3.1(1) is a relaxation from the cyclic-testing requirement where there is low risk to vehicle safety, and to bring the inspection more into line with in-service inspection criteria. An LVV certifier may still elect to perform a 3-cycle brake test where there is reason to believe that risk may be introduced by not conducting the test that would normally be applicable.

Non-performance vehicle brake-testing exclusion

3.1(2)

A modified production low volume vehicle that features no modifications such that the performance or operation of the vehicle cannot be affected, other than that specified below, is not required to undergo brake testing as specified in 2.3, provided that:

(a) the vehicle modifications which relate to performance and operation of the vehicle are limited to wheels and tyres that fall within the certification threshold specified in 4.3 and 4.4 of *Low Volume Vehicle Standard 205-00 (Wheels and Tyres)*; and

(b) the vehicle has no increase in performance; and

(c) there has been no significant weight or balance of weight change; and

(d) the vehicle has no modifications that could directly affect the braking performance; and

(e) form-set *FS023 (Wheels & Tyres)* has been completed.

NOTE 1: 3.1(2) is intended to apply to a vehicle such as a van with seats added, but which also has aftermarket wheels fitted that are under the certification threshold. Without the seats added, this vehicle would not need LVV certification for the changed wheels, and would just be subject to a WoF/CoF inspection.

NOTE 2: The exclusion in 3.1(2) is a relaxation from the requirement for brake-testing where there is low risk to vehicle safety, and to bring the inspection more into line with in-service inspection criteria. An LVV certifier may still elect to perform a one-off or 3-cycle brake test where there is reason to believe that risk may be introduced by not conducting the test that would normally be applicable.

Brake-testing exclusion for series-production vehicles

3.1(3) A modified production low volume vehicle that is one of an identical series of production-run modified vehicles, of more than 10 vehicles per year, is not required to undergo brake testing as specified in 2.3, provided that a test has been conducted in accordance with the requirements specified in 2.3 on an identical vehicle from the same series-production run, and:

- (a) the vehicle modifications are limited to the interior and body/chassis; and
- (b) the vehicle has no increase in performance; and
- (c) the vehicle has no modifications to the engine, brakes and suspension.

NOTE 1: 3.1(3) is intended to apply to a production run such as a series of vans with high roofs for a camper conversion, which are well within the GVM of the vehicle. When the vehicle specification changes, such as introduction of anti-lock brakes, then a new 3-cycle test must be performed. Each certification application must be accompanied by a copy of the relevant brake test, with the VIN of the tested vehicle clearly stated.

NOTE 2: The exclusion in 3.1(3) is a relaxation from the requirement for brake testing where there is low risk to vehicle safety, and to bring the inspection more into line with in-service inspection criteria. An LVV certifier may still elect to perform a one-off or 3-cycle brake test where there is reason to believe that risk may be introduced by not conducting the test that would normally be applicable.

3.2 Low-performance vehicle exclusion

3.2(1) A low volume vehicle which, during the process of conducting the service brake performance test is not able to readily attain a speed of 100 kph, is not required to meet the 100 kph requirement specified in 2.3 and instead must meet 0.6g from whatever speed the vehicle is able to practicably achieve for the purpose of the tests.

NOTE: An average deceleration from a given speed to standstill of 0.6g equates to the stopping times and distances specified in Table 3.2(1) in Appendix 1 of this low volume vehicle standard.

3.3 **Vintage vehicle exclusions**

Non-hydraulic or single axle brake exclusion

3.3(1) A low volume vehicle which was manufactured with non-hydraulic brakes or single-axle brakes which has had braking modifications that improve its braking performance, is not required to meet the requirements specified in 2.3, and instead must be assessed to ensure that the vehicle can safely stop in a controlled manner from whatever speed the vehicle is able to practicably achieve for the purpose of the tests.

Hydraulic brake conversion exclusion

3.3(2) A modified production low volume vehicle that was manufactured before 1939 is not required to comply with the requirements of 2.2(4) if a complete matched single-circuit hydraulic braking system from a later model of the same vehicle make has been installed as a replacement to a cable or rod braking system, provided that:

- (a) there are no other significant modifications to the vehicle; and
- (b) any performance increase is less than 20% from the vehicle's original specification; and
- (c) the master cylinder is new or has been rebuilt by a suitably competent person, and which is supported by suitable documented evidence.

NOTE: This exclusion is provided primarily for the common situation of where a pre-1939 Ford (originally fitted with rod brakes) is upgraded with a hydraulic braking systems from a 1940s-era Ford.

3.4 **Disability vehicle exclusion**

3.4(1) A braking system fitted to a low volume vehicle with additional servo assistance to enable a person with disabilities to operate the brakes with decreased pressure is not required to comply with 2.3(1), provided that a label warning vehicle users of the braking system's increased sensitivity is permanently attached in a prominent location where it is clearly visible to the driver when seated in a normal position.

3.5 **Wet road exclusion**

3.5(1) A low volume vehicle which is required to be tested to 0.65g, but which due to a wet or slippery road surface at the time of testing the testing process may be unsafe, can at the discretion of the LVV certifier be tested to 0.55g.

NOTE: An average deceleration from a given speed to standstill of 0.55g equates to the stopping times and distances specified in Table 3.5(1) in Appendix 1 of this low volume vehicle standard.

3.6 Parking brake exclusion

3.6(1) A low volume vehicle is not required to comply with the requirements of 2.2(27) if the vehicle is either:

(a) a Class-LA, LB, LC, or LD vehicle; or

(b) a Class LE vehicle that was modified before 1 April 2002.

Section 4 Vehicles not required to be certified to this standard

4.1 Vehicles not covered by this standard

4.1(1) A light vehicle is not required to be certified to this low volume vehicle standard, if the vehicle is modified for the purposes of law enforcement or the provision of emergency services.

4.1(2) A light vehicle is not required to be certified to this low volume vehicle standard, if the vehicle is identified as having been modified by a second-stage vehicle manufacturer, and complies with an approved overseas standard that is listed in Annex 6 of the *Low Volume Vehicle Code*.

4.2 Vehicles that pre-date legal requirements

4.2(1) A vehicle is not required to be certified to this standard, if the vehicle was either:

(a) modified before 1 January 1992 in such a way that the vehicle's braking performance may, directly or indirectly, be affected, and the braking components fitted to the vehicle are the same as those fitted at the time of the vehicle's modification; or

(b) scratch-built before 1 January 1992, and the braking components fitted to the vehicle are the same as those fitted at the time of the vehicle's construction.

4.3**Modifications that do not require certification****4.3(1)**

A vehicle is not required to be certified to the *Low Volume Vehicle Code* where the only modification to the vehicle is the fitting of any one or more of the following items, provided that the safe performance of the vehicle is not compromised:

- (a) after-market brake disc pads, linings or hoses (including stainless steel braided brake hoses) which are catalogued for the specific make and model of vehicle to which they are fitted; or
- (b) after-market disc rotors provided that the rotors;
 - (i) are catalogued aftermarket items for the specific make and model of vehicle to which they are fitted (and can include cross-drilled and/or slotted types); and
 - (ii) are the same size as the OEM rotors; and
 - (iii) are attached to unmodified OEM parts;

or

- (c) after-market brake pedal pads or covers provided that the fitment of the pads or covers does not;
 - (i) necessitate any modification to the pedal arm; or
 - (ii) significantly affect the safe operation of the brake pedal or other pedals (eg a brake pad or cover significantly wider than the original brake pad may not be acceptable, depending on fitment);

or

- (d) after-market or custom brake pedal extensions for unusually short people, provided that the fitment of the extension;
 - (i) does not exceed 100mm length when measured from the surface of the original brake pedal; and
 - (ii) is securely clamped to the original pedal by mechanical means, and

- (iii) is sufficiently strong to withstand emergency braking loads; and
- (iv) does not involve any modification to, or compromise the strength of, the original brake pedal; and
- (v) does not significantly change the sideways load or leverage against the pedal; and
- (vi) does not significantly increase the weight of the pedal;

or

- (e) removal of secondary accelerator and brake system (where driving school vehicle is converted to single primary system), provided that:
 - (i) the vehicle was not originally manufactured as a dual-control vehicle (system was retrofitted after manufacture), and;
 - (ii) the removal of the secondary system has reinstated the vehicle's primary systems back to the vehicle's exact original specification;

or

- (f) disability parking brake system provided that the system is a non-OEM mechanical or electrical system for applying and releasing the OEM parking brake, and:
 - (i) the parking brake performance is not compromised, and
 - (ii) in the case of electrical failure, the parking brake does not release;

or

- (g) additional brake pedals for driving school vehicles, provided that:
 - (i) the operation of the primary brake pedal is not affected; and
 - (ii) no modifications to the primary brake pedal or any other part of the primary brake system has occurred.

Section 5 Terms and definitions within this standard

Catalogued	means a part which is manufactured and supplied on a volume production basis for a specified make and model of vehicle, and is listed as such within the part manufacturer's catalogue.
Drum	means the part of a brake assembly upon which an expanding brake shoe causes frictional braking effort.
Low Volume Vehicle Code	is the code of the Low Volume Vehicle Technical Association (Incorporated) that governs the low volume vehicle certification process in New Zealand, and is incorporated within the land transport regulatory framework through incorporation by reference into the <i>Land Transport Compliance Rule 35001/2</i> .
mm	is an abbreviation for millimeters.
Parking brake	means a brake readily applicable and capable of remaining applied for an indefinite period without further attention.
OEM	Is an abbreviation for original equipment manufacturer.
Rotor	means the flat circular part of a wheel hub that is clamped by the disc brake caliper to cause frictional braking effort.
Service brake	means a brake for intermittent use that is normally used to slow down a vehicle.
Spindle	means the stub axle on a suspension upright.
Stub axle	means the cantilevered axle supporting the rotating wheel assembly on a front suspension upright.

NOTE: The terms and definitions found in section 5 are limited to those terms and definitions that are unique to this low volume vehicle standard, and are not necessarily contained within the terms and definitions section of the *Low Volume Vehicle Code*.

Appendix 1

to Low Volume Vehicle Standard 35-00(02) Braking Systems:

LVVTA Deceleration Conversion Tables

Speed (kph)	Time (seconds)	Distance (metres)
100	4.7	65
90	4.2	53
80	3.8	42
70	3.3	32
60	2.8	24
50	2.4	16

Table 3.2(1) Stopping times and distances at 0.6g

Speed (kph)	Time (seconds)	Distance (metres)
100	5.1	71
90	4.6	58
80	4.1	46
70	3.6	35
60	3.1	26
50	2.6	18

Table 3.5(1) Stopping times and distances at 0.55g