

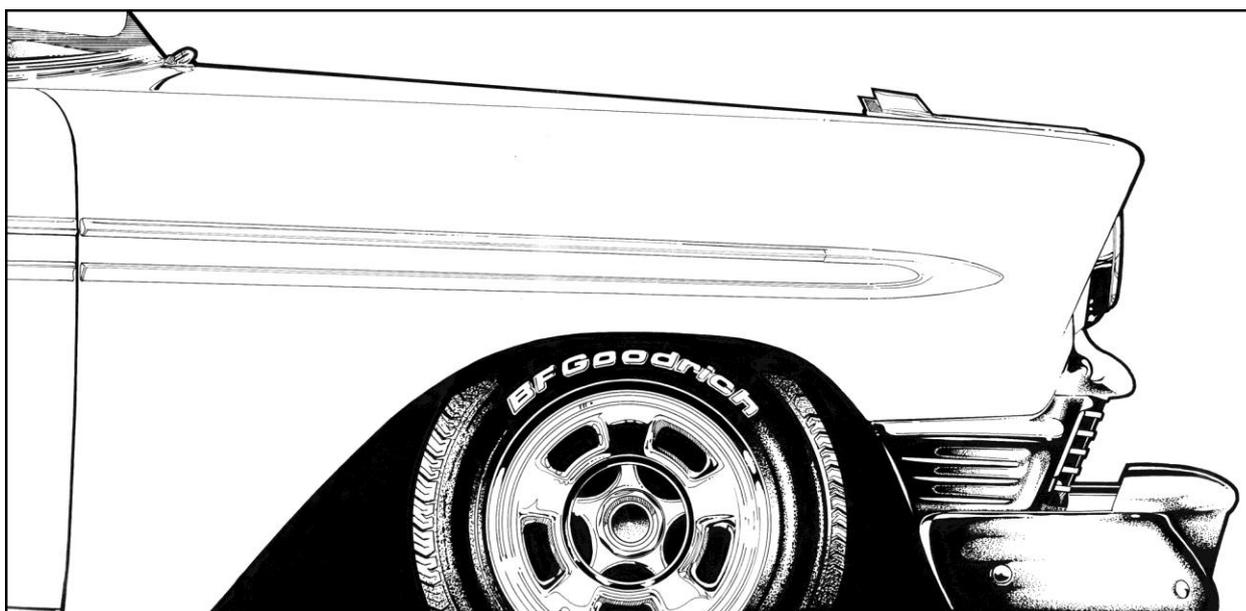
Low Volume Vehicle Technical Association Incorporated

Low Volume Vehicle Standard

205-00(02)

(Wheels and Tyres)

This Low Volume Vehicle Standard corresponds with: Land Transport Rule 32013 (Tyres and Wheels)



2nd Amendment – effective from: 25 October 2016

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

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4				
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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.lvvta.org.nz

Further information on the availability of the low volume vehicle standards may be obtained by contacting the LVVTA at info@lvvta.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 2 'Aftermarket Wheel Failure'
• LVVTA News October-December 2013 Issue 48	Page 7 'Tyres Stretched Beyond LVVTA's Tyre to Rim Size Compatibility Guide'
• LVVTA News January-July 2014 Issue 49	Page 9 'Cross-ply Tyres Only for Traditionally-styled Low-powered Cars'
• LVVTA News January-July 2014 Issue 49	Page 11 'One Wheel – Four Sizes!'
• LVVTA News August-December 2014 Issue 50	Page 10 'Watch for Aluminium Wheel Nuts Part Two'
• LVVTA News January-April 2015 Issue 51	Page 5 'These Tyres are Junk!'
• LVVTA News January-April 2015 Issue 51	Page 5 'Poor Quality Wheel Adaptors'
• LVVTA News May-July 2015 Issue 52	Page 10 'Aluminium Wheel Nuts (Follow-up)'

• LVVTA News May-July 2015 Issue 52	Page 10 'Big Wheels on Chrysler 300Cs'
• LVV Information Sheet # 01-2009	Tyre Size to Rim Size Compatibility Guide
• LVV Information Sheet # 01-2011	Supreme-brand Aftermarket Wheels
• LVV Information Sheet # 04-2012	Suspension Camber Angle Guide
• New Zealand Car Construction Manual	Chapter 12 Wheels & Tyres
<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>	

Contents

Purpose of this standard		Page 5
Section 1	Scope and application of this standard	5
1.1	Scope of this standard	5
1.2	Application of this standard	5
Section 2	Technical requirements of this standard	6
2.1	General safety requirements	6
2.2	Wheel suitability requirements	7
2.3	Wheel modification and manufacturing requirements	10
2.4	Wheel attachment requirements	15
2.5	Wheel spacing and adaptation requirements	17
2.6	Tyre requirements	20
2.7	Other requirements	22
Section 3	Exclusions to this standard	22
3.1	Original equipment exclusions	22
3.2	Mudguard exclusions	23
Section 4	Vehicles not required to be certified to this standard	23
4.1	Vehicles not covered by this standard	23
4.2	Vehicles that pre-date legal requirements	23
4.3	Wheel fitments that do not require certification	23
4.4	Tyre fitments that do not require certification	24
Section 5	Terms and definitions within this standard	24

Wheels and Tyres

(205-00[02])

Purpose of this standard

The purpose of this low volume vehicle standard is to specify requirements for aftermarket, one-off, or modified wheels, wheel-related equipment, and non-original fitment tyres, that are fitted to light vehicles, in order to optimise levels of safety performance during all normal and emergency driving conditions.

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 March 1999 in such a way that any wheels or tyres may, directly or indirectly, be affected; or
- (b) scratch-built on or after 1 March 1999.

NOTE: Because of the application of the *Transport (Vehicle Standards) Regulations 1990* for Brakes to MA class vehicles on 1 January 1992, and MB, MC, and NA class vehicles on 1 January 1993, and the relationship between wheels and tyres and braking performance, the *Low Volume Vehicle Code* also applies to all such vehicles.

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

- (a) powered bicycles of Class AB; or
- (b) motorcycles and mopeds of Class LA, LB, LC, or LD; or
- (c) light trailers of Class TA or TB; or
- (d) 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 March 1999), 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.

- 2.1(2) The components of the complete assembly of tyre, wheel, hub, and axle must be in good condition and must be compatible with the type, design and performance requirements of the vehicle of which they are a part.
- 2.1(3) Tyres on the same axle must be of the same size designation and construction, and of the same tread pattern type.
- 2.1(4) A tyre must be of good quality and construction, fit for its purpose and maintained in a safe condition.
- 2.1(5) A tyre must not have worn, damaged or visible cords apparent by external examination.
- 2.1(6) If fitted, asymmetric tyres must be fitted in axle sets in accordance with the manufacturer's instructions.
- 2.1(7) If fitted, a unidirectional tyre must be fitted to a wheel position corresponding to its direction of rotation.

- 2.1(8) A tyre on a motor vehicle must have a tread pattern, excluding any tie-bar or tread-depth indicator strip, of not less than 1.5 mm in depth within all principal grooves that contain moulded tread depth indicators and around the entire circumference of the tyre.

NOTE: The requirements specified in 2.1(2) to 2.1(8) are the applicable general safety requirements from 2.2 and 2.3 of the *Land Transport Rule: Tyres and Wheels 2001 (Rule 32013)*, (slightly amended for consolidation), reproduced here in the interest of convenience.

2.2 Wheel suitability requirements

Wheel compatibility

- 2.2(1) Each pair of front wheels, or rear wheels, fitted to a low volume vehicle must be of the same width, diameter, mounting configuration, and approximate offset.

Wheel loading

- 2.2(2) A wheel fitted to a low volume vehicle must be:
- (a) purpose-designed for automotive road use; and
 - (b) designed to withstand:
 - (i) the combination of vehicle weight and vehicle load weight; and
 - (ii) the cornering and braking forces applied by the motion of the vehicle.

- 2.2(3) A wheel that is manufactured by a high volume motor vehicle manufacturer, must not be fitted to a low volume vehicle that has a higher tare weight, or gross vehicle mass, or axle load, than the vehicle to which the wheel was originally fitted.

- 2.2(4) A wheel fitted to a low volume vehicle must be thoroughly visually inspected to ensure that;
- (a) the design and the strength of the wheel appears consistent with the common time-proven makes; and
 - (b) there is no evident deterioration or cracking, particularly around wheel attachment points; and
 - (c) the wheel is of an appropriate size for use with the weight and performance characteristics of the vehicle to which it is fitted.

NOTE: There is a popular brand of aftermarket wheel sold predominantly in the United States of America known as the 'Supreme' wheel, about which there is a known history of failure as a result of poor design and manufacturing. For detailed information on these wheels and what to look for, refer to *LVV Information Sheet # 01-2011 'Supreme'-brand Aftermarket Wheels*, available from www.lvvt.org.nz

Wheel width

2.2(5) A wheel fitted to a low volume vehicle must be of a width:

- (a) not less than, measured between tyre bead seats;
 - (i) in the case of a low volume vehicle based on a post-1960 body style, that originally fitted to the vehicle, or 114 mm [4.5 inches]; or
 - (ii) in the case of a light-weight low volume vehicle based on a pre-1960 vintage, sports, or period special body style, 88 mm [3.5 inches];

or

- (b) in the case of an unusually light-weight low volume vehicle or a vehicle of LE-Class that has a tare of 500 kg or less, not less than that which can be proven to be of adequate load rating for the application.

Safety bead humps

2.2(6) A wheel fitted to a low volume vehicle must be either:

- (a) of a type which incorporates double-sided safety bead humps; or
- (b) fitted with an inner tube which is compatible with the tyre to which it is fitted.

Wheel track

2.2(7) A low volume vehicle that has four wheels and tyres, must have a front wheel track, measured from centre to centre of the tyre treads, that is within 20% of the rear wheel track.

Wheel offset

2.2(8) The wheel offset on a wheel fitted to a low volume vehicle, other than a vehicle specified in 2.2(9), measured from hub flange to wheel width centre-line, including any spacers or adaptors if fitted, must: [see diagram 2.2(8)]

- (a) be no more than 35% of the total wheel width positive or negative; or
- (b) in the case of an offset outside of the requirements specified in 2.2(8)(a), either:
 - (i) be used in association with axle and hub components from a vehicle which are substantially heavier than the vehicle to which the suspension and axle componentry is now fitted; or
 - (ii) be used in association with a fully-floating hub and axle assembly; or
 - (iii) meet the requirement of 12.13.1 of Chapter 12 of the *New Zealand Car Construction Manual*.

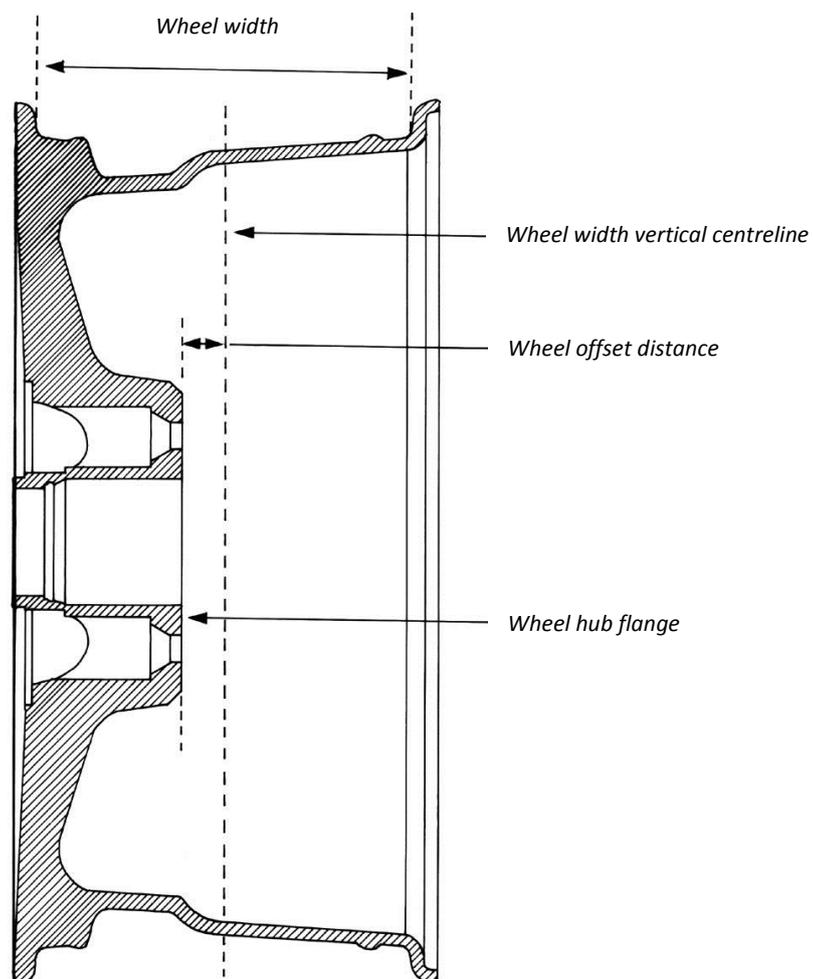


Diagram 2.2(8) Wheel offsets

Dual wheel conversions

- 2.2(9) A low volume vehicle originally equipped with a rear axle that has a single wheel configuration, may be converted to a dual wheel configuration, provided that the greater loads imposed by the increased wheel offset introduced by the second wheel, are compensated for by either:
- (a) the fitting of a complete dual-wheel axle assembly sourced from a production vehicle of similar or greater weight; or
 - (b) the fitting of another single wheel axle that was sourced from a vehicle that is substantially heavier than the vehicle to which the axle assembly is now fitted; or
 - (c) the conversion of the original single wheel axle to a semi-floating or fully-floating hub axle assembly.

2.3 Wheel modification and manufacturing requirements

All wheel modifications

- 2.3(1) A wheel fitted to a low volume vehicle may be modified, provided that the modification is carried out by a person who is recognised by a low volume vehicle certifier as:
- (a) being competent and experienced in the type of work being undertaken; and
 - (b) being professionally engaged in the wheel manufacturing or modification industry; and
 - (c) having the necessary equipment to carry out the modifications safely.

Wheel pitch circle diameter modifications

- 2.3(2) A wheel fitted to a low volume vehicle may be modified to provide a change in pitch circle diameter by re-drilling, elongating, or slotting of the wheel center, provided that:
- (a) the modification incorporates either:
 - (i) centering sleeves and washers to locate and secure the wheel; or

- (ii) in the case of an aluminium wheel, the drilling and pressing in of a steel insert to accept a tapered wheel nut or bolt;

and

- (b) the modification is carried out by a person who meets the requirements specified in 2.3(1).

Steel wheel widening

2.3(3) A steel wheel fitted to a low volume vehicle may be widened, provided that:

- (a) there is no significant run-out or misalignment; and
- (b) in the case of a wheel that has the center fixed to the rim by riveting, the center is re-fixed to the rim by welding; and
- (c) the amount by which the wheel is widened is not more than;
 - (i) in the case of a wheel having a diameter of 10 inches or less, 51 mm; or
 - (ii) in the case of a wheel having a diameter of more than 10 inches, 76 mm;

and

- (d) the widening is carried out by a person who meets the requirements specified in 2.3(1); and
- (e) the welding involved in the widening process is carried out by a person who meets the requirements specified in 2.3(7).

2.3(4) A steel wheel fitted to a low volume vehicle that is widened through the insertion of a steel band must, in addition to 2.3(3), have the steel band:

- (a) joined at the section of the wheel that incorporates the smallest diameter; and
- (b) the band is made from a mild steel material of a thickness of not less than 3 mm.

Bead-lock wheels

2.3(5)

A wheel fitted to a low volume vehicle may, in order to prevent inward dislodgement or rotational movement of a tyre on a wheel, be modified to incorporate a bead-lock tyre attachment system, provided that:

- (a) the wheel is of steel construction; and
- (b) the two steel rings are manufactured from a mild steel material of not less than 6 mm thickness, either:
 - (i) cut as a continuous ring with no joins; or
 - (ii) formed from a single piece of flat bar and joined by butt-welding;

and

- (c) the inner ring provides not less than 15 mm of bearing surface to support the tyre bead; and
- (d) the two steel rings are welded fully around the circumference of their respective wheel sections; and
- (e) the two steel rings incorporate a means of enabling a visual inspection to establish that the two surfaces are correctly positioned; and
- (f) the wheel retains the 5-degree slope where the tyre bead seats at the base of the wheel rim; and
- (g) all edges which contact the tyre surface incorporate a radius of not less than 3 mm; and
- (h) the pitching of the fasteners used to attach the two wheel sections are positioned no further apart than 10 degrees; and
- (i) the torque setting specified by the wheel manufacturer for the tightening of the fasteners attaching the two wheel sections is clearly and permanently stamped on the outer face of each wheel; and
- (j) the bead-lock conversion work is carried out by a person who meets the requirements specified in 2.3(1); and
- (k) the welding involved in the bead-lock conversion process is carried out by a person who meets the requirements specified in 2.3(7).

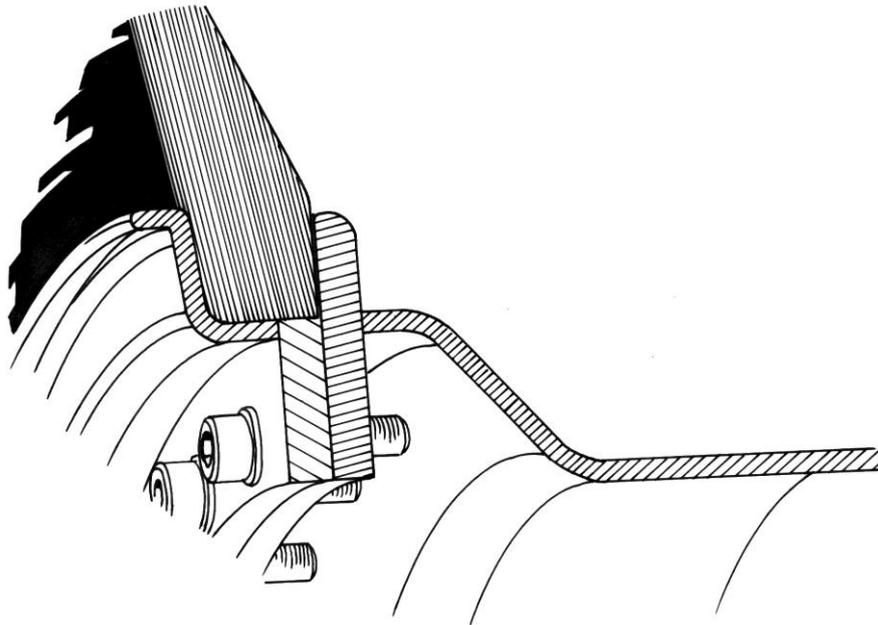


Diagram 2.3(5) Bead-lock wheels

- 2.3(6) A fastener used to attach the two wheel sections of a bead-lock wheel together must:
- (a) be of equal or greater size and strength than either:
 - (i) 1/4 inch UNF grade-8 imperial; or
 - (ii) 6 mm SAE grade-10.9 metric;
- and
- (b) incorporate the correct length of bolt shank for the application; and
 - (c) incorporate a vibration-proof washer or other locking mechanism; and
 - (d) be coated with an anti-corrosive material; and
 - (e) not be electroplated unless:
 - (i) the electroplating process is carried out as part of the manufacturing process by the fastener manufacturer; or

- (ii) in the case of electroplating that is carried out by someone other than the fastener manufacturer, documented evidence is provided to substantiate that appropriate heat treatment procedures have been applied to eliminate any hydrogen entrapment that may have occurred during the electroplating process.

Wheel welding

2.3(7) A wheel fitted to a low volume vehicle may be modified by welding, provided that:

- (a) the modification is a specialised modification to a steel wheel, such as either:
 - (i) wheel widening or centre-changing; or
 - (ii) the conversion of a wheel to a bead-lock tyre attachment system using a design and modification method specified in 2.3(5) and 2.3(6);

and

- (b) except in the case of 2.3(8), any welding involved in the modification process is carried out by a person who, in addition to meeting the requirements specified in 2.3(1), either:
 - (i) holds a relevant current qualification or trade certification for the type of welding being undertaken; or
 - (ii) has demonstrated to a low volume vehicle certifier, a satisfactory level of competence in the method of welding being undertaken;

and

- (c) a report is supplied to the low volume vehicle certifier by the person who undertakes the welding to record the welding procedures involved, and where appropriate, the welder's qualification or certification details.

NOTE: Aluminium wheels must not be repaired unless the repair is carried out in accordance with the requirements specified for wheel repair within the *Land Transport Rule: Wheels and Tyres 2001 (Rule 32013)*, in which case it is not a modification.

2.3(8) A wheel fitted to a low volume vehicle that has been modified by welding, for which no evidence is available to substantiate that 2.3(7)(b) has been complied with, must:

- (a) undergo a thorough visual inspection on both surfaces of each wheel for weld quality, penetration, fatigue cracking, and surface corrosion; and
- (b) in the case of where any doubt exists in relation to the condition of the wheel or quality of the welding, be:
 - (i) non-destructively tested, using a method appropriate for the examination of fatigue cracking or weld penetration, by a person holding not less than a current NDT Level 2 qualification in CBIP, ASNT, AINDT, or other equivalent certification; and
 - (ii) accompanied by a report, supplied by the person who undertakes the non-destructive testing, to verify that the requirements of 2.3(8)(b)(i) have been met, and that the wheel is considered to be serviceable for road use.

Hand-built and custom-manufactured wheels

2.3(9)

A wheel which is hand-built or custom-manufactured, either through a casting or a machining process, by someone other than a recognised high-volume aftermarket wheel manufacturer, that is fitted to a low volume vehicle, **must meet the requirements of 12.13.1 of Chapter 12 of the New Zealand Car Construction Manual.**

2.4

Wheel attachment requirements

Wheel and hub assembly compatibility

2.4(1)

A wheel fitted to a low volume vehicle must:

- (a) attach to a disc rotor flange or drum or hub face that is large enough in diameter to adequately support the wheel; and
- (b) have an inside face that is compatible with the hub assembly face to which the wheel attaches; and
- (c) have no obstructions that could prevent full and even contact between the wheel or the hub or drum face, including set-screws, balance weights, drum shoulder ribs, or the disc caliper; and
- (d) be securely fastened to the hub assembly.

Wheel nut or bolt engagement

2.4(2)

A wheel nut or bolt fitted to a low volume vehicle to secure a wheel against a hub assembly must have a mating surface that is compatible to, and machined at the same angle as, the recess in the wheel to which it attaches.

- 2.4(3) The wheel stud or bolt hole diameter machined into a wheel fitted to a low volume vehicle must be compatible with the diameter of the wheel stud, to ensure that the wheel nut or bolt properly pulls the wheel against the hub face.
- 2.4(4) A wheel stud or bolt attaching a wheel to a low volume vehicle must engage into or through the corresponding nut or hub assembly by either:
- (a) not less than the diameter of the stud thread; or
 - (b) a specified number of full turns of thread engagement, which must be not less than:
 - (i) in the case of a 12 mm metric stud or bolt with a 1.5 mm coarse thread pitch, 6.5 turns; or
 - (ii) in the case of a 12 mm metric stud or bolt with a 1.25 mm fine thread pitch, 7.5 turns; or
 - (iii) in the case of a 14 mm metric stud or bolt with a 1.5 mm coarse thread pitch, 7.5 turns; or
 - (iv) in the case of a 7/16 inch, 1/2 inch, or 3/8 inch imperial stud or bolt, 7.5 turns;

or

- (c) in the case of an unmodified hub assembly, not less than that originally provided for the fitment by the original vehicle manufacturer.

Wheel studs, nuts or bolts

- 2.4(5) A wheel stud, nut, or bolt fitted to a low volume vehicle must:
- (a) be of a type that is purpose-designed for automotive use; and
 - (b) in the case of adaptors being fitted, meet the requirements specified in 2.5(6); and
 - (c) be in good condition; and
 - (d) in the case of a stud, be attached to the hub assembly in such a way as not to be able to turn with wheel nut tightening; and
 - (e) in the case of a wheel nut which is not made as original equipment by a high-volume vehicle manufacturer, be made from steel.

NOTE: For the avoidance of doubt, aftermarket wheel nuts made from aluminium must not be fitted to any motor vehicle, whether the vehicle is modified or not.

Wheel stud or bolt load capabilities

2.4(6) A low volume vehicle fitted with an engine that is substantially heavier than that which the original hub assembly was designed to support, must have either:

- (a) the original hub assembly replaced by a hub assembly from another vehicle which has an increased number of studs or bolts; or
- (b) the original wheel studs or bolts replaced by studs or bolts of a diameter equivalent to that of a production vehicle which has a similar engine weight and number of wheel studs or bolts.

2.4(7) A low volume vehicle fitted with a wheel that has an amount of offset specified in 2.2(8)(c) must have either:

- (a) the original wheel studs or bolts replaced by studs or bolts of a diameter not less than one size larger; or
- (b) the original hub assembly replaced by a hub assembly from another vehicle that either:
 - (i) has an increased number of studs or bolts; or
 - (ii) is of a size in comparison to the original, that will withstand the additional loadings presented by the increased wheel offset.

Centre-lock attachment systems

2.4(8) A splined hub with a centre-lock nut fitted to a low volume vehicle must, if not original equipment, be designed for a vehicle of equivalent or greater weight than the vehicle to which the system is fitted.

2.5 Wheel spacing and adaptation requirements

Spacer requirements for all wheels

2.5(1) A wheel spacer fitted to a low volume vehicle between the wheel and hub assembly, other than that fitted as original equipment by a high volume vehicle manufacturer, must:

- (a) be purpose-designed for automotive applications, and either be manufactured by a recognised automotive wheel spacer manufacturer, or be manufactured by a person who is recognised by an LVV Certifier as:

- (i) being competent and experienced in the type of work being undertaken; and
- (ii) having the necessary equipment to carry out the manufacturing process correctly;

and

- (b) have a maximum spacing of each wheel away from the hub surface of 20 mm; and
- (c) be manufactured from a solid block of suitable material; and
- (d) have two machined or die-cast surfaces that are parallel, and contain minimal indentations or irregularities; and
- (e) be fitted as to ensure the wheel locates snugly over the hub spigot so that the hub carries the weight of the wheel assembly instead of the wheel studs, or where there is a mis-match between the hub spigot and the wheel centre, a close tolerance fit center bore locator must be provided; and
- (f) be set-screwed or attached by another secure method to either the wheel or hub face; and
- (g) maintain, with the spacer fitted, not less than the minimum required amount of wheel stud or bolt engagement specified in 2.4(4); and
- (h) not be fitted in conjunction with another wheel spacer or wheel adaptor.

Additional spacer requirements for cast aluminium wheels

2.5(2)

A wheel spacer fitted to a low volume vehicle with cast aluminium wheels, or any other wheels that incorporate a full hub contact surface area, in addition to meeting 2.5(1), may incorporate additional holes within the spacer for multi-fitting purposes, provided that:

- (a) the spacer is designed to fit only one stud configuration; and
- (b) there is sufficient material provided between the multi-fit holes in order to resist deformation of the spacer.

NOTE: 'Configuration' means, within the context of 2.5(2)(a), that whilst a spacer can be of a multi-fitting design in that it fits varying pitch circle diameters, it must be of a type that will fit either a four-stud wheel or a five-stud wheel, but not both. Spacers that will fit both four-stud and five-stud wheels must not be used in any situations.

Additional spacer requirements for pressed steel wheels

2.5(3)

A wheel spacer fitted to a low volume vehicle with pressed steel wheels, or any other wheels which incorporate a minimal hub contact surface area, in addition to meeting 2.5(1), must not incorporate any additional holes within the spacer other than those used to:

- (a) where the design of the hub assembly allows, locate the centre hub spigot to the wheel, which must be a close tolerance fit; and
- (b) attach the spacers to the hub face or wheel rim; and
- (c) enable the wheel studs being used to attach the wheel to pass through, which must match the stud pattern of the vehicle.

Wheel adaptor design and manufacture

2.5(4)

A wheel adaptor fitted to a low volume vehicle between the hub and wheel assembly to affect a change in the wheel stud pattern or pitch circle diameter, must:

- (a) be purpose-designed for automotive applications, manufactured by a recognised automotive wheel adaptor manufacturer or be manufactured by a person who is recognised by an LVV Certifier as:
 - (i) being competent and experienced in the type of work being undertaken; and
 - (ii) having the necessary equipment to carry out the manufacturing process correctly;

and

- (b) be manufactured from a single block of suitable material; and
- (c) be of a thickness that,
 - (i) unless the hub assembly donor vehicle is substantially heavier than the vehicle to which the adaptors are fitted, provides a maximum spacing of each wheel away from the hub surface of 30 mm; and
 - (ii) does not exceed the maximum allowable amount of offset specified in 2.2(8) when the wheel adaptor thickness is included within the wheel offset.

Wheel adaptor location

- 2.5(5) A wheel adaptor fitted to a low volume vehicle between the hub and wheel assembly to affect a change in the wheel stud pattern, must locate with a close tolerance fit using the centre spigot or tapered wheel nuts or bolts:
- (a) the adaptor against the hub assembly; and
 - (b) the wheel assembly against the adaptor.

Wheel adaptor attachment

- 2.5(6) A wheel adaptor fitted to a low volume vehicle between the hub and wheel assembly to affect a change in the wheel stud pattern, must attach:
- (a) with no interference between any fastenings attaching the wheel to the adaptor, or adaptor to the hub assembly; and
 - (b) using wheel nuts, studs, or bolts for both the attachment of the adaptor to the hub assembly, and the wheel to the adaptor, that:
 - (i) are a correct match for the type of wheel stud or bolt hole; and
 - (ii) are of a type purpose-designed for automotive use; and
 - (iii) are of a suitable size and pitch circle diameter to carry the loads imposed under normal vehicle operation; and
 - (iv) incorporate not less than the minimum required amount of wheel stud or bolt thread engagement specified in 2.4(4).

- 2.5(7) A wheel adaptor must not be fitted to a low volume vehicle in conjunction with a wheel spacer or another wheel adaptor.

2.6 Tyre requirements**Tyre suitability**

- 2.6(1) A low volume vehicle must be fitted with tyres that:
- (a) are specified by the tyre manufacturer for road use; and
 - (b) are an appropriate selection for the type and width of wheel to which they are fitted; and

- (c) do not have any visible defects or removal of any sidewall information markings.

NOTE: For detailed information on appropriate tyre selections for rim widths, as required by 2.6(1)(b), refer to *LVV Information Sheet # 01-2009 Tyre Size to Rim Size Compatibility Guide*, available from www.lvvta.org.nz

- 2.6(2) Tyres fitted to a low volume vehicle must be of the same carcass construction on both axles, except in the case of:
- (a) a rear-drive vehicle used for motor-sport purposes that is fitted with radial tyres on the front axle, and tyres of a different carcass construction fitted on the rear axle; or
 - (b) a vehicle of Class MC, LE1, LE2, and MD2.

NOTE: Where a low volume vehicle specified in 2.6(2)(a) is fitted with tyres of differing front-to-rear carcass construction, the low volume vehicle certifier must have “unmatched f to r tyre construction” recorded on the exemption field of the low volume vehicle compliance plate.

Tyre compliance

- 2.6(3) A tyre fitted to a low volume vehicle must comply with one or more of the approved standards specified in 2.7 of the *Land Transport Rule: Tyres and Wheels 2001 (Rule 32013)*, and either:
- (a) be permanently marked on the sidewall with the marking of the approved standard with which the tyre complies; or
 - (b) be accompanied by documentary evidence to substantiate compliance with the approved standard with which the tyre complies.

Tyre loading and performance

- 2.6(4) A low volume vehicle must be fitted with tyres capable of meeting the load-carrying potential of the vehicle, in accordance with *table 2.6(4)*. [see *table 2.6(4)*]

Load index symbol	0	10	20	30	40	50	60	70	80	90	100	110	120
Max. load rating (kg)	45	60	80	106	140	190	250	335	450	600	800	1060	1400

Table 2.6(4) Tyre load symbols and rating

- 2.6(5) A low volume vehicle must be fitted with tyres capable of meeting the performance potential of the vehicle, in accordance with *table 2.6(5)*. [see *table 2.6(5)*]

Speed rating symbol	L	M	N	P	Q	R	S	T	U	H	V	Z
Max. vehicle speed (km/h)	120	130	140	150	160	170	180	190	200	210	240	240+

Table 2.6(5) Tyre speed symbols and rating

- 2.6(6) A tyre fitted to the front of a low volume vehicle must have a tread section width of no less than 30% of the tread section width of the rear tyre.

Tyre positioning

- 2.6(7) A tyre fitted to a low volume vehicle must be positioned in such a way that it does not rub on any suspension, steering, or braking components, or the chassis, sub-frame, body structure, or outer body panels, during all normal vehicle operation.

- 2.6(8) A tyre fitted to a low volume vehicle must be contained within the confines of the bodywork, and no part of the tread section may protrude beyond the outer edge of the body, mudguard, or mudguard flare or extension.

2.7 Other requirements

A low volume vehicle that is required to comply with this standard must also comply with any applicable requirements of the LVVTA Low Volume Vehicle Standard 35-00 (*Braking Systems*).

Section 3 Exclusions to this standard

3.1 Original equipment exclusions

- 3.1(1) A low volume vehicle that is 30 years or older, or replicates a specific make and model of vehicle that is 30 years old or older, is not required to comply with 2.6(3), provided that the vehicle is fitted with a size and type of tyre that was supplied as standard or optional equipment by the vehicle manufacturer or manufacturer of the vehicle being replicated.

- 3.1(2) A modified production low volume vehicle that is fitted with an unmodified hub and wheel assembly, that was the original equipment fitted to the vehicle at the time of manufacture, is not required to comply with 2.4(4).

3.2 **Mudguard exclusions**

A low volume vehicle, for which a valid *Low Volume Vehicle Authority Card* is issued by an LVVTA-approved organization, that specifies 'mudguard exemption', is not required to comply with 2.6(8).

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 March 1999** in such a way that any wheels or tyres may, directly or indirectly, be affected, and the wheels and tyres fitted to the vehicle are the same as those fitted at the time of the vehicle's modification; or
 - (b) scratch-built before **1 March 1999**, and the wheels and tyres fitted to the vehicle are the same as those fitted at the time of the vehicle's construction.

4.3 **Wheel fitments that do not require certification**

4.3(1) A vehicle is not required to be certified to the *Low Volume Vehicle Code*, provided that the safe performance of the vehicle is not compromised, where the fitment of non-standard wheels is the sole modification, provided that the wheels:

- (a) are of a known and reputable brand, and are catalogued as an appropriate fitment for the vehicle type by the wheel manufacturer; and
- (b) the wheels are not modified; and
- (c) no spacers or adaptors are fitted; and
- (d) the tyre tread does not protrude beyond:
 - (i) the unmodified original body panels (including unmodified factory-fitted mudguard extensions); or
 - (ii) 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 25 mm from the vehicle's original specification.

4.4

Tyre fitments that do not require certification

4.4(1)

A vehicle is not required to be certified to the *Low Volume Vehicle Code*, provided that the safe performance of the vehicle is not compromised, where the fitment of non-standard tyres is the sole modification, provided that:

- (a) the tyres have a diameter or outer circumference that is no more than 5% greater than the vehicle's original specification; and
- (b) the tyres are an appropriate selection for the rim width, and
- (c) the tread of the tyres do not extend beyond the original or modified body panels or mudguard extension.

Section 5 Terms and definitions within this standard

Adaptor	means a component that enables a road wheel to be attached to a hub assembly that has a pitch circle diameter or number of wheel studs that is not directly compatible with the wheel.
All-wheel drive	means a system which transmits drive from the engine and transmission to all road wheels fitted to the vehicle, in such a way that allows the vehicle to be driven normally on sealed road surfaces.
Bead-lock	means a design of wheel that incorporates an inner flange, which together with the outer flange of the wheel, clamps against each side of the tyre bead, in order to prevent inward dislodgement and rotational movement of the tyre on the wheel, when operated at lower than usual tyre pressures.

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.
Fully-floating	means a hub assembly that contains more than one axle bearing, and supports the driving axle independently of the wheel assembly.
Front-drive	means a system which transmits drive from the engine and transmission to the road wheels fitted to the front of the vehicle.
mm	is an abbreviation for millimeters.
Offset	means the distance between the vertical centerline of the wheel, and the hub flange to which the wheel attaches.
Rear-drive	means a system which transmits drive from the engine and transmission to the road wheels fitted to the rear of the vehicle.
Spacer	means a component which is used to position a wheel assembly outward, by the thickness of the spacer, from the hub assembly to which the wheel attaches.
Stud	means one of a series of fixed threaded pins, to which is fitted a matching nut, used as a method of securing a wheel to a hub assembly.
Tare	means, in the context of this standard, the unladen weight of a vehicle.
Wheel track	means the distance between the vertical centerlines of the tyre tread on two tyres fitted at opposite ends of the same axle.

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*.