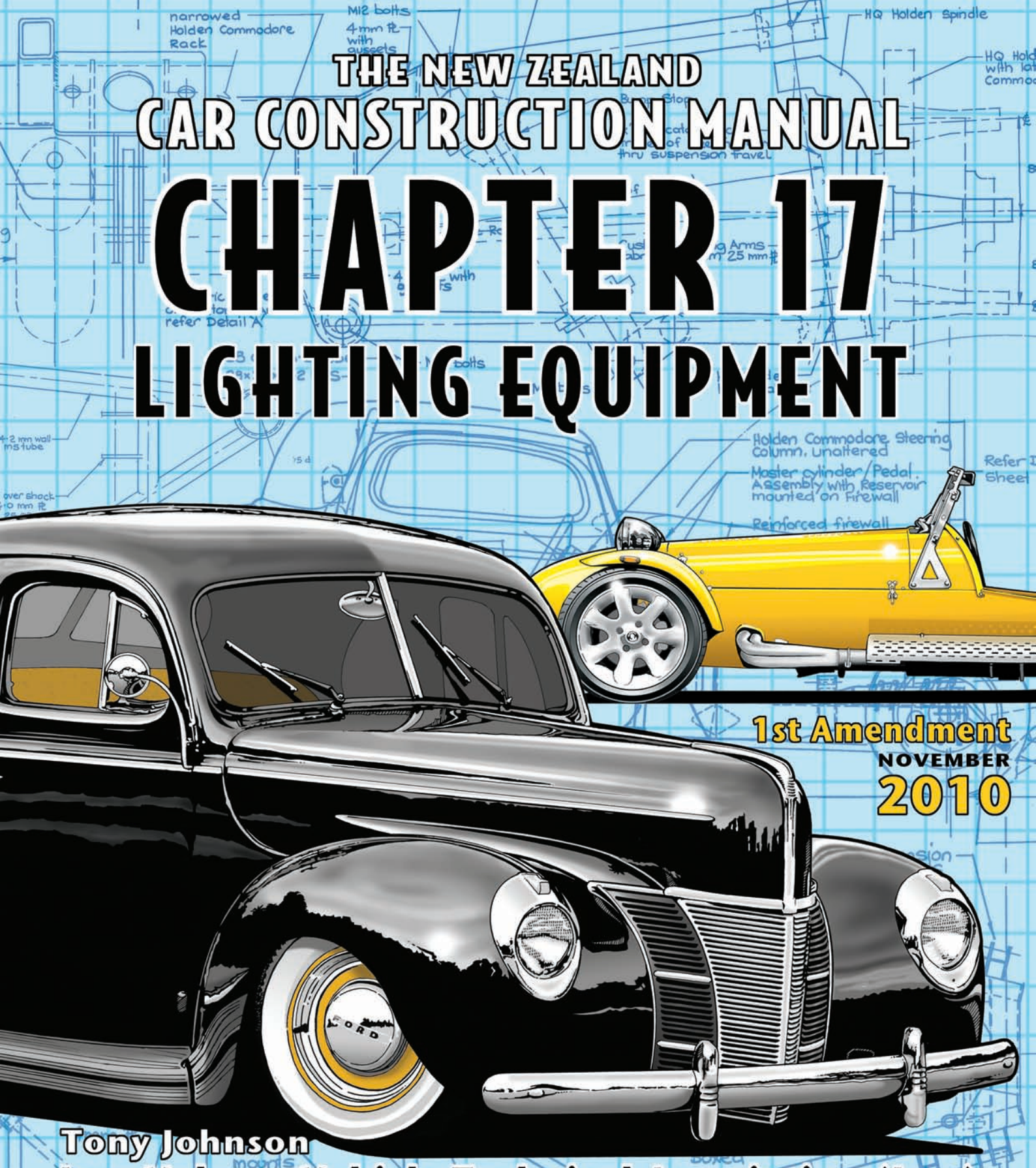
THE NEW ZEALAND

CAR CONSTRUCTION MANUAL

CHAPTER 17

LIGHTING EQUIPMENT



1st Amendment
NOVEMBER
2010

Tony Johnson

Low Volume Vehicle Technical Association (Inc.)

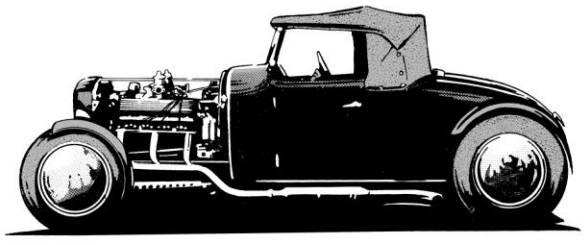
THE NEW ZEALAND
CAR
CONSTRUCTION MANUAL

Author: Tony Johnson

Publisher: The Low Volume Vehicle Technical Association Incorporated

First Published January 2007

1st Amendment November 2010



International Standards Book Number: ISBN 978-0-473-11935-5

PUBLISHER & OWNER

The New Zealand Car Construction Manual is published and owned by the Low Volume Vehicle Technical Association Incorporated (LVVTA). LVVTA is an incorporated society and was established in 1992, and represents approximately 50,000 motor vehicle enthusiasts throughout New Zealand.

The New Zealand Car Construction Manual was originally published by the New Zealand Hot Rod Association Incorporated (NZHRA), in January 2007.

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ACKNOWLEDGEMENT

The LVVTA wishes to acknowledge the New Zealand Hot Rod Association for its determination and vision in undertaking the original development of the New Zealand Car Construction Manual, and for demonstrating its on-going long-term commitment to all vehicle modifiers and builders by enabling this manual to become an integrated part of New Zealand's low volume vehicle certification system.

NZHRA, and its key personnel, have, and continue to since the inception of LVV certification, form the back-bone of the LVV certification system in New Zealand. LVVTA is very appreciative of NZHRA's on-going commitment and integrity.

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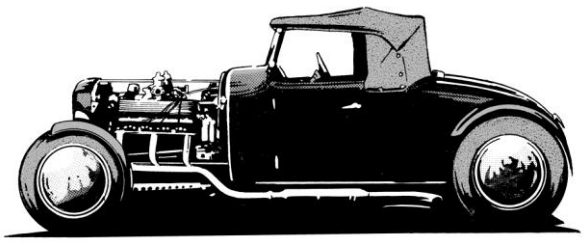

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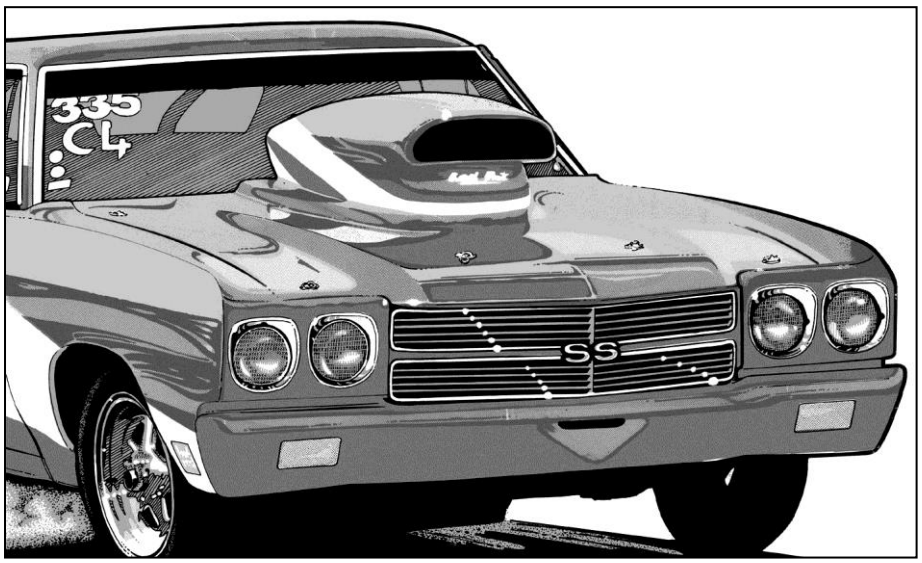
Chapter 17:

LIGHTING EQUIPMENT



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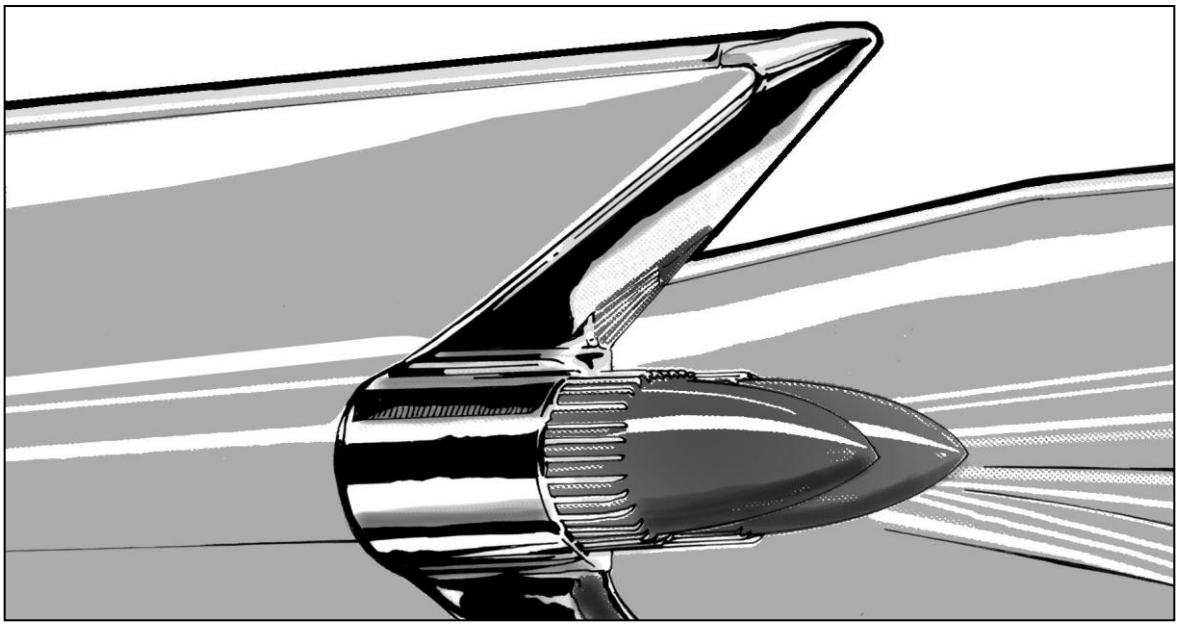
Chapter 17 Contents

Key: (for full key details, refer to 'Chapter 2 – About this Manual')

Normal type: Provisions of the NZ Car Construction Manual for all vehicles
Normal type in shaded box: Special provisions of the NZ Car Construction Manual for vehicles built or modified before specified dates
Italic type: *Extracts from any relevant LVVTA Low Volume Vehicle Standards*
Script type: Helpful hints, tips, explanations, clarifications, and interpretations
Shaded text & dotted vertical stroke in margin: Latest amendments since previous version



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CHAPTER 17: LIGHTING EQUIPMENT

Introduction:

The purpose of this low volume vehicle standard is to specify safety requirements for lamps that are added, substituted, or modified, and their installation on a low volume vehicle, that will provide safe driving visibility to the driver, and that will increase the conspicuousness of the vehicle for other road users during all driving conditions and weather types. Note that where a production vehicle is fitted with its original lamps in their original location, the requirements in this chapter do not apply.

Design & construction requirements for all lamps

17.1 Design and construction of all lamps

17.1.1

A lamp fitted to a low volume vehicle must be:

(a) *constructed or coated so as to be corrosion resistant; and*

(b) *designed, manufactured, and assembled in such a way as to prevent the entry of moisture or foreign material.*

17.1.2

A lamp fitted to a low volume vehicle must be designed and attached so as to enable ready access for replacement of bulbs.

17.2 Attachment and positioning of all lamps

17.2.1

A lamp fitted to a low volume vehicle must be:

(a) *securely mounted; and*

(b) *free from vibration; and*

(c) *correctly aligned.*

17.2.2

A lamp that is required by this low volume vehicle standard to be fitted to a low volume vehicle must not be obscured by any modifications to the vehicle, fitment of additional equipment, or the carriage of any load.

17.2.3

A lamp fitted to a low volume vehicle, other than a headlamp or fog-lamp, must not be concealed when not in use.

17.3 Colour of all lamps

17.3.1

A low volume vehicle must not be fitted with lighting equipment that emits red light that is directly visible from the front of the vehicle.

17.3.2

A low volume vehicle must not be fitted with, except for reversing lamps, a lamp or reflector that emits or reflects other than red or amber light if the light is directly visible from the rear of the vehicle.

17.3.3

Lighting equipment that is fitted as a pair to the front or to the rear of a low volume vehicle must emit light of approximately equal colour when operated.

17.4 Performance of all lamps

17.4.1

Lighting equipment fitted to a low volume vehicle must be:

(a) *in sound condition and good working order; and*

(b) *in the case of an LED array, have no more than 25% of the LEDs not working.*

17.4.2

The light emitted from a lamp fitted to a low volume vehicle, other than from a direction indicator, must be steady.

17.4.3

Lighting equipment that is fitted as a pair to the front or to the rear of a low volume vehicle must emit light of approximately equal intensity when operated.

17.4.4

Lighting equipment fitted to a low volume vehicle must be capable of providing sufficient illumination, light output or light reflection to:

(a) *fulfil its intended purpose; and*

(b) *enable the vehicle to which it is fitted to be operated safely on a road.*

17.5 Overlays

17.5.1

An overlay must not be applied to a lens fitted to a low volume vehicle if that overlay would reduce the mechanical and optical properties of the lamp below a safe tolerance.

17.5.1

Provided that an overlay is completely clear with no colouring or tinting, as is the case with most commercially manufactured adhesive protective overlays, the requirements specified in 17.5.1 will be met.

17.6

Headlamps are the most important part of a low volume vehicle's lighting system, as they affect the driver's vision, the vehicle's conspicuousness, and oncoming motorists' ability to see without being dazzled. As such, there can be no compromises in relation to headlamps on a low volume vehicle for any reason.

A vehicle must have dipped-beam headlamps, but main-beam headlamps are not actually a legal requirement.

17.6.2

See the 'Motorsport exclusions' in 17.82 at the back of this chapter for those vehicles which may be fitted with additional lamps than specified in 17.6.2.

Headlamp requirements

17.6 Number of headlamps

17.6.1

A low volume vehicle must be fitted with one pair of dipped-beam headlamps.

17.6.2

A low volume vehicle is not required to be fitted with main-beam headlamps, but if fitted, may have one or two pairs of main-beam headlamps.

17.7 Colour of headlamps

17.7.1

When operated, a headlamp that is fitted to a low volume vehicle must emit a beam of light that is substantially white or amber.

17.8 Positioning of headlamps

17.8.1

A pair of headlamps that are fitted to a low volume vehicle must be:

(a) *positioned at the front of the vehicle; and*

(b) *symmetrically arranged.*

17.8.2

A pair of dipped-beam headlamps fitted to a low volume vehicle must be positioned at a width and height that is in accordance with the requirements specified in Table 17.1.

17.8.3

A pair of main-beam headlamps fitted to a low volume vehicle may be positioned at any width or height.

17.8.3

This includes the fitment of roof-mounted high-beam headlamps on an off-road vehicle.

ORIENTATION	REQUIREMENTS
Width:	▪ no further inboard than 400 mm (16") from the outer-most part of the vehicle; or
	▪ in the case of a low volume vehicle that is less than 1300 mm (53") in width, no less than 400 mm (16") apart; or
	▪ in the case of a low volume vehicle whose body design makes achieving this impractical, no less than 600 mm (24") apart; or
	▪ in the case of a vehicle for which a valid LVV Authority Card issued by the New Zealand Hot Rod Association (Inc) has been issued that specifies 'mudguard exemption', closer to the vertical centreline of the adjacent tyre than to the longitudinal centreline of the vehicle.*
Height:	▪ no less than 250 mm (10") from the ground; and
	▪ no more than 1500 mm (61") from the ground.

Notes to accompany table 17.1

- All lamps fitted to a low volume vehicle must be positioned as far toward the outer edges of the vehicle as practicable, so as to reasonably indicate to other road users at night, the approximate width of the vehicle.
- *This means that the distance from the lamp to the centreline of the tyre is less than the distance from the lamp to the vehicle centreline.

Table 17.1 Positioning of lamps

17.9 Operation of headlamps

17.9.1

A main-beam headlamp fitted to a low volume vehicle must be able to be dipped or extinguished from the driver's seating position.

17.9.2

A low volume vehicle fitted with main-beam headlamps must be fitted with an internal warning light that is blue in colour, which indicates to the driver that the main-beam headlamps are in operation.

17.9.2

A modified production low volume vehicle may be fitted with a main-beam warning light of any colour, provided that the light was fitted as original equipment by the vehicle manufacturer.

17.10 Electrical connections for headlamps

17.10.1

The wiring system in a low volume vehicle that is fitted with main-beam headlamps, must extinguish the main-beam headlamps when the dipped-beam headlamps are operated.

17.10.2

The wiring system in a low volume vehicle that is fitted with main-beam headlamps, may enable a dipped-beam headlamp to remain illuminated when the main-beam headlamps are operating.

17.10.3

Activation of either the dipped-beam or main-beam headlamps in a low volume vehicle must automatically also activate the:

(a) *rearward-facing position lamps; and*

(b) *registration-plate illumination-lamps.*

17.11 Adjustment of headlamps

17.11.1

A headlamp assembly in a high volume vehicle must:

(a) *be aligned so as to meet the New Zealand Transport Agency's alignment requirements; and*

(b) *be designed and installed so as to incorporate sufficient provision for adjustment in order to meet the requirement of 17.11.1(a), and continue to meet these requirements despite any changes of height and loading that may occur during the life of the vehicle.*

17.12 Headlamp sources

17.12.1

A filament bulb or high-intensity gas discharge headlamp fitted to a low volume vehicle, other than one built or modified before January 1992, must comply with any one or more of the approved standards specified for headlamps listed in Table 17.2, by either incorporating the applicable standards markings on the headlamp lens, or through other supplementary documented evidence. (see Table 17.2)

LAMP TYPE	UN/ECE Regulation No:	European Council Directive	Australian Design Rule	Federal Motor Vehicle Safety standard	Japanese Technical Standard	Japanese Industrial Standard
▪ Headlamps	UN/ECE 1, 5, 8, 20, 31, 98, 112, 113	76/761/EEC	ADR 47	FMVSS 108	Technical Std for Headlamps (Japan)	JIS D5504, JIS D5500
▪ Stop-lamps	UN/ECE 7	76/758/EEC	ADR 49	FMVSS 108	Technical Std for Lamps (Japan)	JIS D5500
▪ High-mounted stop-lamps	UN/ECE 7		ADR 60	FMVSS 108	Technical Std for Auxiliary Stop Lamps (Japan)	JIS D5500
▪ Direction-indicators	UN/ECE 6	75/759/EEC	ADR 6	FMVSS 108	Technical Std for Direction Indicators (Japan)	JIS D5500
▪ Forward-facing position-(park) lamps	UN/ECE 7	76/758/EEC	ADR 49	FMVSS 108	Technical Std for F&R Position (Side) Lamps (Japan)	JIS D5500
▪ Rearward-facing position-(park) lamps	UN/ECE 7	76/758/EEC	ADR 49	FMVSS 108	Technical Std for Front & Rear Position (Side) Lamps (Japan)	JIS D5500
▪ Rear registration-plate illumination-lamps	UN/ECE 4	76/760/EEC	ADR 48	FMVSS 108	Technical Std for Number Plate Lamps (Japan)	JIS D5500
▪ Retro-reflectors	UN/ECE 3	76/757/EEC	ADR 47	FMVSS 108	Technical Std for Rear Reflex Reflectors (Japan)	JIS D5500
▪ Daytime running-lamps	UN/ECE 87	---	ADR 45, ADR 76	FMVSS 108	---	---
▪ Reversing-lamps	UN/ECE 23	77/539/EEC	ADR 1	FMVSS 108	Technical Std for Back-up Lamps (Japan)	JIS D5500
▪ Fog-lamps	UN/ECE 19	76/762/EEC	ADR 50	FMVSS 108	Technical Std for Front Fog Lamps (Japan)	JIS D5500

Notes to accompany table 17.2

- 'DOT' marked on a lamp lens denotes that the lamp complies with an FMVSS Standard listed in this table.

Table 17.2 Approved standards for lamps

17.12.2

A filament bulb headlamp that does not meet an approved standard specified in Table 17.2 may be fitted to a modified production low volume vehicle, or a scratch-built 'historic replica' low volume vehicle, provided that the lamp lens:

(a) *either:*

(i) *was fitted to a production vehicle as original equipment; or*

(ii) *is manufactured from glass, by an aftermarket lamp manufacturer as a direct replacement for an original equipment lamp fitted to a production vehicle;*

and

(b) *the production vehicle for which the lamp is manufactured is a later model vehicle than the low volume vehicle to which the lamp is fitted, or in the case of a scratch-built 'historic replica' low volume vehicle, the vehicle being replicated.*

17.12.2(b)

This means where a lamp from a production vehicle is fitted, the lamp must always be from a later-model vehicle, and not an older vehicle, so that the lighting performance of the modified vehicle is always increased, not decreased, as a result of the lamp retro-fitment.

A low volume vehicle built or modified before January 1992 is not required to have headlamps that comply with an approved standard.

17.13.1

17.13 Modern headlamps in old housings

17.13.1

A modified production low volume vehicle, or a scratch-built 'historic replica' low volume vehicle, may incorporate a modern headlamp within an old headlamp housing in order to achieve modern headlamp performance and period aesthetics, provided that:

(a) *the performance of the headlamp exceeds that of the headlamp originally fitted to the vehicle; and*

(b) *the lens fitted to the old headlamp does not adversely affect the optical properties and performance of the modern headlamp; and*

(c) *the installation does not prevent the headlamp from complying with any other headlamp requirement.*

In order to comply with 17.13.1, it will usually be necessary to either replace the old factory-supplied lens with un-patterned clear glass, or remove the lens from the new headlamp, so that the new lamp reflector and bulb projects directly through the old lens.

17.13.1(b)

A Low Volume Vehicle Certifier may accept receipt of documented evidence that the vehicle has been approved for a WOF or COF by an Authorised Vehicle Inspector as verification of compliance with 17.13.1(b).

17.14 Concealed headlamps

17.14.1

A low volume vehicle may be fitted with concealed headlamps, provided that:

(a) *a single switching operation both activates the movement of the headlamp assemblies into position, and illuminates the headlamps; and*

(b) *in the event of a failure of the mechanism that moves the lamps into their operating position;*

(i) *the lamp assemblies can be moved into, and will remain located in, their operating positions without the use of tools; and*

(ii) *the lamps will still illuminate.*

17.15 Swivelling headlamps

17.15.1

A headlamp fitted to a low volume vehicle may be mechanically controlled by the steered wheels to swivel in the horizontal plane, provided that:

(a) *only the main-beam headlamps are able to swivel; and*

(b) *the dipped-beam headlamps remain fixed; and*

(c) *the headlamp alignment meets the visibility requirements specified in 17.11.1 whilst the steered wheels are in the straight-ahead position.*

17.16 Headlamp compatibility

17.16.1

A bulb fitted to a headlamp in a low volume vehicle must be of a type that is compatible with the bulb holder, lamp housing, and lens.

17.16.2

A dipped-beam headlamp designed solely for a left-hand drive motor vehicle, where the maximum intensity of the beam is dispersed to the right, must not be fitted to a low volume vehicle.

17.17 Headlamp shields and covers

17.17.1

A low volume vehicle may incorporate a headlamp positioned behind a permanent protective shield, provided that:

(a) *the protective shield is either:*

17.16.1

This refers in particular to the fitting of HID (high intensity discharge) bulbs to normal lamp housings. HID bulbs are not compatible with regular lamps, as this combination greatly increases levels of glare to other road users, and therefore HID bulbs must not be retro-fitted to housings that were not designed to be used with HID bulbs.

Fitment of quartz halogen bulbs into regular lamps are generally a successful, and therefore acceptable, retro-fitment. However, the wattage of any headlamp bulb should not exceed 65 watts.

(i) *manufactured from a clear transparent material that is in good unmarked condition; or*

(ii) *an open wire mesh designed for use as a stone guard;*

and

(b) *the protective shield does not prevent the headlamp from complying with any other headlamp requirements.*

17.17.2

A headlamp fitted to a low volume vehicle may be covered by a readily removable protective cover when it is not in use.

Stop-lamp requirements

17.18 Number of stop-lamps

17.18.1

A low volume vehicle must be fitted with either one or two pairs of stop-lamps.

See the 'Stop-lamp exclusions' in 17.83 at the back of this chapter for those vehicles which may be fitted with a single stop-lamp.

17.19 Colour of stop-lamps

17.19.1

When operated, a stop-lamp fitted to a low volume vehicle must emit diffuse light that is substantially red.

17.20 Positioning of stop-lamps

17.20.1

A stop-lamp fitted to a low volume vehicle must be positioned to the rear of the vehicle.

17.20.2

A pair of stop-lamps fitted to a low volume vehicle must be symmetrically arranged.

17.20.3

A pair of stop-lamps fitted to a low volume vehicle must be positioned at a width and height that is in accordance with the requirements specified in Table 17.1.

17.21 Operation of stop-lamps

17.21.1

A stop-lamp fitted to a low volume vehicle must illuminate when the vehicle's ignition system is on, and the service brake is applied.

17.22 Visibility (output) of stop-lamps

17.22.1

A stop-lamp fitted to a low volume vehicle must, when in operation, provide an output of not less than:

(a) *in the case of a filament bulb, 20 watts; or*

(b) *in the case of an LED array, equivalent brightness to a 20 watt filament bulb stop-lamp.*

17.22.2

A stop-lamp fitted to a low volume vehicle must, when in operation, emit light that is clearly visible during conditions of clear daylight, from a distance of 100 m (328') directly behind the vehicle.

17.22.3

A stop-lamp fitted to a low volume vehicle must, when both the stop-lamps and rearward-facing position-lamps are illuminated, be visibly and substantially brighter than the rearward-facing position-lamps.

17.23 Visibility (angles) of stop-lamps

17.23.1

A stop-lamp fitted to a low volume vehicle, other than one built or modified before January 1992, must, when operated, emit light that is visible within an angle of at least:

(a) *on a horizontal plane passing through the lamp:*

(i) *15 degrees above; and*

(ii) *15 degrees below;*

and

(b) *45 degrees either side of a vertical plane that is parallel to the longitudinal centre-line of the vehicle and passing through the lamp. (see Diagram 17.1)*

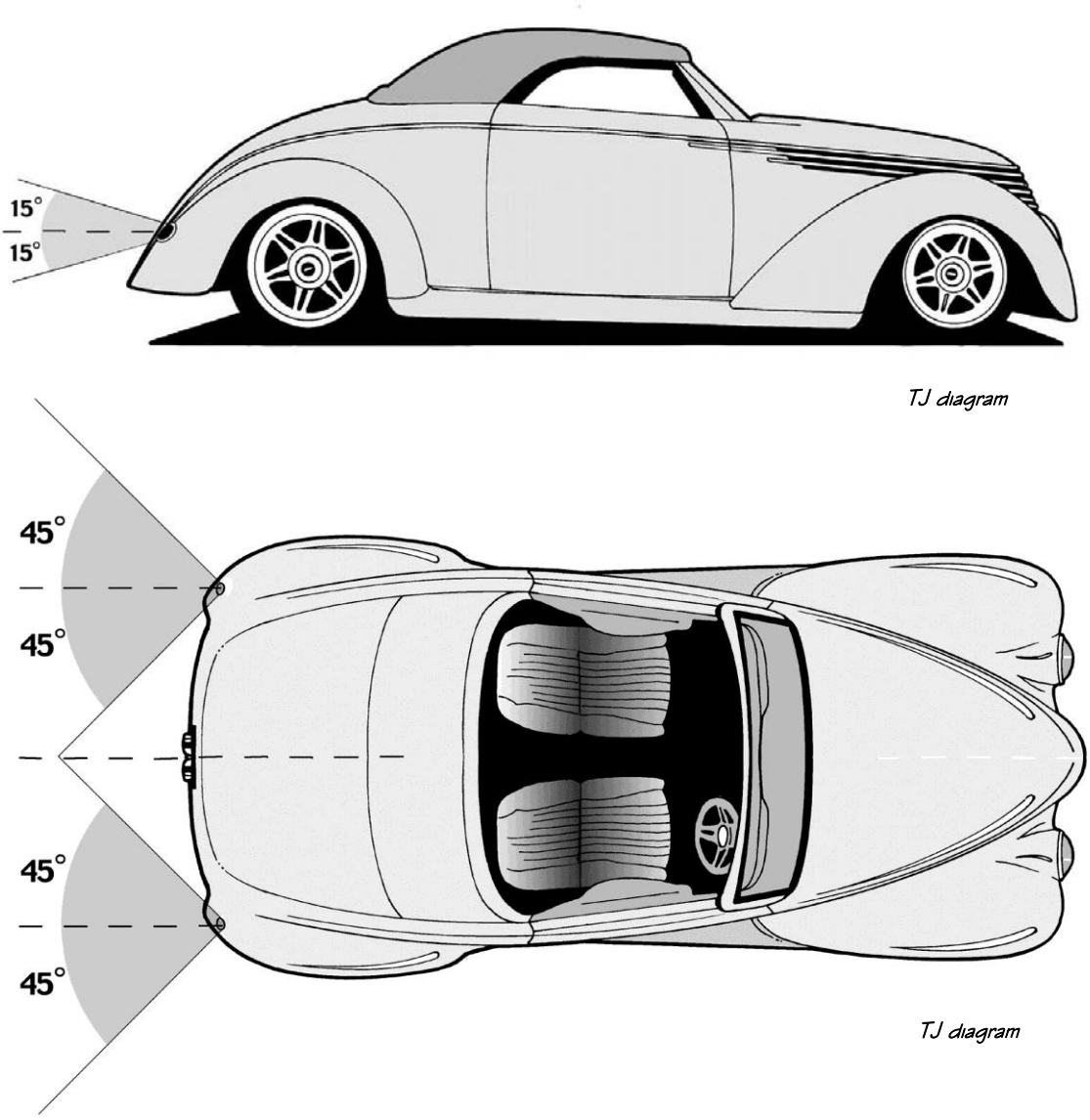


Diagram 17.1 Visibility angles for stop-lamps

17.24 Size of stop-lamps

17.24.1

A stop-lamp fitted to a low volume vehicle must incorporate a luminous lens surface area of not less than:

(a) *in the case of a filament bulb, 22 sq cm (3 ½ sq"); or*

(b) *in the case of an LED array, sufficient area so as to provide at least equivalent conspicuousness as a filament bulb specified in 17.24.1(a).*

17.25 Stop-lamp sources

17.25.1

A filament bulb or LED array stop-lamp fitted to a low volume vehicle, other than one built or modified before January 1992, must comply with any one or more of the approved standards specified for stop-lamps listed in Table 17.2, by either incorporating the applicable standards markings on the stop-lamp lens, or through other supplementary documented evidence. (see Table 17.2)

17.25.2

A filament bulb or LED array stop-lamp fitted to a low volume vehicle, other than one built or modified before January 1992, that does not meet any one or more of the approved standards listed in Table 17.2, may be fitted provided that the lamp meets the requirements specified in Table 17.3.

LAMP SOURCE	REQUIREMENTS
Lamps (filament bulb) sourced from production vehicles with no standards markings – OK if:	▪ was fitted to a production vehicle as original equipment; or ▪ lens is manufactured from glass, by an aftermarket lamp manufacturer as a direct replacement for an OE production vehicle lamp; and
	▪ the production vehicle for which the lamp is manufactured is a later model vehicle than the low volume vehicle to which the lamp is fitted (or in the case of a scratch-built low volume vehicle, the vehicle being replicated);* and
	▪ in the case of a lamp that does not incorporate a reflector or reflectorised housing behind the bulb, reflected light is maximized by either: ➢ covering the face of the lamp housing behind the bulb with reflective aluminium tape;** or ➢ installing a reflector disc behind the bulb.
Custom-manufactured (filament bulb) lamp OK if:	▪ made from materials and incorporates components that are resistant to atmospheric and weather degradation, in particular elastomeric materials used for weather sealing; and
	▪ lens is either: ➢ part of a OE lamp fitted to a production vehicle which meets an approved standards specified in Table17.2; or *** ➢ custom-manufactured from sheet material, and documented evidence is provided to the LVV certifier to substantiate that the optical properties and ultra-violet light resistance of the sheet-material is acceptable.****
Custom-manufactured (LED array) OK if:	▪ lamp has been assessed and approved in writing by the Low Volume Vehicle Technical Association (Inc) as complying with specified photometric and other performance requirements.*****

Notes to accompany Table 17.3

- *This requires that where a lamp from a production vehicle is fitted, the lamp must always be from a later-model vehicle, and not an older vehicle, so that the lighting performance of the modified vehicle is always increased, and not decreased, as a result of the lamp retro-fitment.
- **The application of aluminium tape is successful only where the body of the housing is flat or tapered. Where a bulb sits within a deep recess in the housing with predominantly vertical sides, a reflector disc should be installed rather than tape.
- ***If a stop-lamp lens is custom-made from a part of an OE lamp from a production vehicle, and the custom-made lens does not incorporate the approved standards markings from the OE lens, the remainder of the OE lens (from which the custom-made stop-lamp lens is cut) should be retained and made available to the LVV certifier in order to verify to the LVV certifier the origin of the custom-made lens.
- ****In such cases, LVVTA should be consulted to confirm the suitability of the material.
- *****Over-intensity is an inherent potential problem with a custom-manufactured LED array lamp, and such a lamp cannot be correctly assessed without photometric laboratory testing on a case-by-case basis.
- This table does not apply to headlamps, high-mounted stop-lamps, and retro-reflectors.

Table 17.3 Lamp sources

A low volume vehicle built or modified before January 1992 is not required to have stop-lamps that comply with an approved standard, or that meet the requirements of Table 17.3.

17.26 Blue-dot inserts for stop-lamps

17.26.1

A stop-lamp fitted to a low volume vehicle must not incorporate a blue-dot accessory insert within the lens.

High-mounted stop-lamp requirements

17.27 Number of high-mounted stop-lamps

17.27.1

A low volume vehicle of Class-MA manufactured on or after 1 January 1990 must be fitted with one high-mounted stop-lamp.

17.27

The New Zealand entry compliance process requires that any MA-class vehicle (irrespective of age) first registered in New Zealand on or after 1 January 1990 must be fitted with a high-mounted stop-lamp.

'MA-class' means any passenger car or station wagon.

A low volume vehicle is not required to be fitted with a high-mounted stop-lamp if the vehicle was either manufactured before 1 January 1990, or is of a class other than MA.

17.28 Colour of high-mounted stop-lamps

17.28.1

When operated, a high-mounted stop-lamp fitted to a low volume vehicle must emit diffuse light that is substantially red.

17.29 Positioning of high-mounted stop-lamps

17.29.1

A high-mounted stop-lamp fitted to a low volume vehicle must be fitted:

(a) *in a central high-mounted position at the rear of the vehicle, so that no part of its illuminated area is lower than 150 mm (6") below the bottom edge of the rear window of the vehicle; or*

(b) *in the case of a vehicle that does not have a rear window, in a central high-mounted position at the rear of the vehicle.*

17.30 Size of high-mounted stop-lamps

17.30.1

A high-mounted stop-lamp fitted to a low volume vehicle must be:

(a) *not less than 22 sq cms (3 ½ sq "); and*

(b) *predominantly rectangular in shape.*

17.31 Operation of high-mounted stop-lamps

17.31.1

A high-mounted stop-lamp fitted to a low volume vehicle must illuminate:

(a) *when the vehicle's ignition system is on, and the service brake is applied; and*

(b) *in conjunction with the main stop-lamps.*

17.32 Visibility of high-mounted stop-lamps

17.32.1

A high-mounted stop-lamp fitted to a low volume vehicle must, when in operation, provide an output of not less than:

(a) *in the case of a filament bulb, 15 watts; or*

(b) *in the case of an LED array, equivalent brightness to a 15 watt filament bulb high-mounted stop-lamp.*

17.32.2

A high-mounted stop-lamp fitted to a low volume vehicle must, when in operation, emit light that is clearly visible during conditions of clear daylight, from a distance of 100 m (328') directly behind the vehicle.

17.33 High-mounted stop-lamp sources

17.33.1

A filament bulb or LED array high-mounted stop-lamp may be fitted to a low volume vehicle, provided that the lamp is proven to comply with any one or more of the approved standards specified for high-mounted stop-lamps listed in Table 17.2, by either incorporating the applicable standards markings on the high-mounted stop-lamp lens, or through other supplementary documented evidence. (see Table 17.2)

17.33.2

A filament bulb high-mounted stop-lamp that is custom-manufactured, must be made from materials and incorporate components, that are resistant to atmospheric and weather degradation, in particular elastomeric materials used for weather sealing.

17.33.3

A lens for a filament bulb high-mounted stop-lamp that is custom-manufactured, may be fitted to a low volume vehicle, provided that either:

(a) *the lens is part of a stop-lamp, high-mounted stop-lamp, or rearward-facing position-lamp lens that was fitted to a post-1979 production vehicle as original equipment when the vehicle was manufactured; or*

(b) *in the case of a lens custom-manufactured from sheet material, the lens is supported by documented evidence to the LVV Certifier to substantiate that the optical properties and ultra-violet light resistance of the sheet material is acceptable.*

17.33.4

A custom-manufactured LED-array high-mounted stop-lamp must not be fitted to a low volume vehicle unless the lamp has been assessed and approved in writing by the Low Volume Technical Association (Inc) as complying with specified photometric and other performance requirements.

17.33.3

If a high-mounted stop-lamp lens is custom-made from a part of an OE lamp from a production vehicle, and the custom-made high-mounted stop-lamp lens does not incorporate the approved standards markings from the OE lens, the remainder of the OE lens from which the custom-made high-mounted stop-lamp lens is cut should be retained and made available to the LVV Certifier in order to verify the origin of the custom-made lens.

Where 17.33.3(a) applies, the LVVTA should be consulted to confirm the suitability of the material.

17.33.4

Over-intensity is an inherent potential problem with a custom-manufactured LED array lamp, and such a lamp cannot be correctly assessed without photometric laboratory testing on a case-by-case basis.

Direction-indicator lamp requirements

17.34 Number of direction-indicator lamps

17.34.1

A low volume vehicle must be fitted with one or two pairs of direction-indicator lamps to the front, and one or two pairs of direction-indicator lamps to the rear of the vehicle.

See the 'Direction-indicator lamp exclusions' in 17.84 at the back of this chapter for those vehicles which are not required to be fitted with direction-indicators.

17.35 Colour of direction-indicator lamps

17.35.1

When operated, a forward-facing direction-indicator lamp fitted to a low volume vehicle must emit a flashing light that is substantially white or amber.

17.35.2

When operated, a rearward-facing direction-indicator lamp fitted to a low volume vehicle must emit a flashing light that is substantially red or amber.

17.35.3

When operated, if fitted, a side-facing direction-indicator lamp fitted to a low volume vehicle must emit a flashing light that is substantially amber.

17.36 Positioning of direction-indicator lamps

17.36.1

A pair of direction-indicator lamps fitted to a low volume vehicle must be symmetrically arranged.

17.36.2

A direction-indicator lamp fitted to the front of a low volume vehicle must be positioned within a housing that is separate to the headlamp housing, so that the performance of both the direction-indicator and the headlamp cannot adversely affect each other.

17.36.3

A pair of direction-indicator lamps fitted to a low volume vehicle, other than one built or modified before January 1992, must be positioned at a width and height that is in accordance with the requirements specified in Table 17.1.

17.37 Size of direction-indicator lamps

17.37.1

A direction-indicator lamp fitted to a low volume vehicle must incorporate a luminous lens surface area of not less than:

(a) *in the case of a filament bulb, 22 sq cm (3 ½ sq "); or*

(b) *in the case of an LED array, sufficient area so as to provide at least equivalent conspicuity as a filament bulb specified in 17.37.1(a).*

17.38 Operation of direction-indicator lamps

17.38.1

The light emitted from a direction-indicator fitted to a low volume vehicle must operate at a fixed frequency of:

(a) *not less than 60 flashes per minute; and*

(b) *not more than 120 flashes per minute.*

17.38.2

A direction-indicator system fitted to a low volume vehicle must incorporate, either visually or audibly, when in operation:

(a) *a warning system to inform the driver that the direction-indicator lamps are in operation; and*

(b) *a warning system to inform the driver of the failure of one or more bulbs within the direction-indicator system.*

17.38.3

A direction-indicator system fitted to a low volume vehicle must:

(a) *flash each direction-indicator within the system in phase with each other; and*

(b) *switch all direction-indicator lamps on either side of the vehicle on and off together with a single control.*

17.39 Electrical connections for direction-indicator lamps

17.39.1

A direction-indicator fitted to the rear of a low volume vehicle may be either:

(a) *an individual item of lighting equipment; or*

(b) *incorporated within the rearward-facing position-lamp and stop-lamp circuits, so that when in operation, the direction-indicator illuminates or cancels, as necessary, the rearward-facing position-lamp and stop-lamp.*

17.39.2

A low volume vehicle may be fitted with a switching device that activates all direction-indicator lamps simultaneously to function as hazard lamps.

17.39.1(b)

A direction-indicator incorporated within the rearward-facing position-lamp is the standard system that has been used in the American automobile industry for many decades.

17.40 Visibility (output) of direction-indicator lamps

17.40.1

A direction-indicator lamp fitted to a low volume vehicle must, when in operation, provide an output of not less than:

(a) *in the case of a filament bulb, 15 watts; or*

(b) *in the case of an LED array, equivalent brightness to a 15 watt filament bulb direction-indicator lamp.*

17.40.2

A direction-indicator lamp fitted to a low volume vehicle, other than one built or modified before January 1992, must, when in operation, emit light, both with and without the dipped-beam headlamp in operation, throughout the visibility angles specified in 17.41.1, that is clearly visible during conditions of clear daylight from a distance of 100 m (328').

17.41 Visibility (angles) of direction-indicator lamps

17.41.1

A direction-indicator lamp fitted to a low volume vehicle must, when operated, emit light that is visible within an angle of at least:

(a) *on a horizontal plane passing through the lamp:*

(i) *15 degrees above; and*

(ii) *15 degrees below;*

and

(b) *on a vertical plane that is parallel to the longitudinal centre-line of the vehicle, and passing through the lamp:*

(i) *45 degrees inboard; and*

(ii) *80 degrees outboard, or in the case of a vehicle manufactured before 1970, or whose body replicates a vehicle manufactured before 1970, and the design of the body makes achieving an 80-degree outboard visibility angle impractical, 45 degrees. (see Diagram 17.2)*

17.41.1(b)(ii)

The 80 degree visibility requirement may be met by the fitment of an automotive side repeater lamp, which may use bulbs of less output than that specified in 17.40.1.

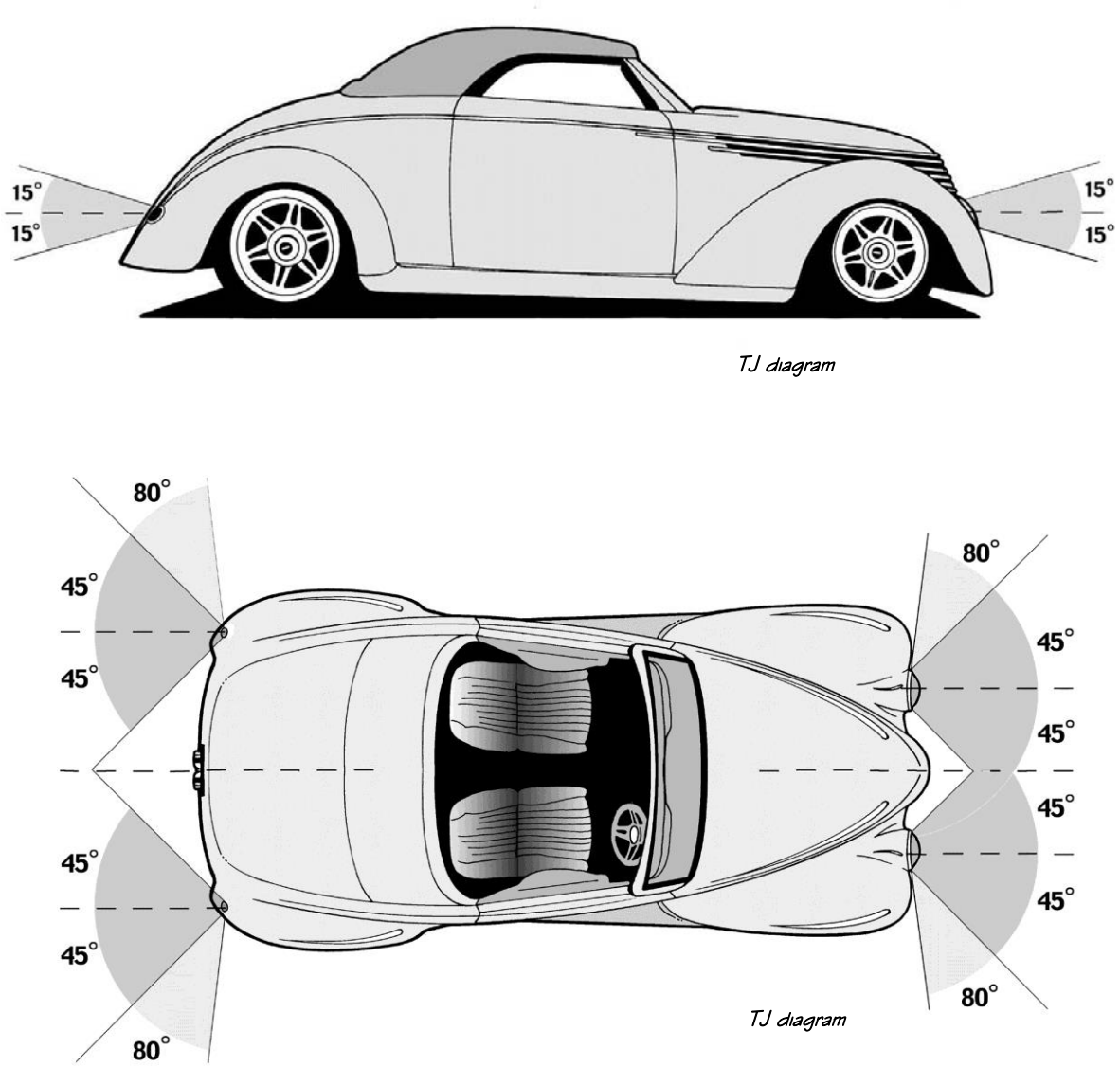


Diagram 17.2 Visibility angles for direction-indicators

A low volume vehicle built or modified before January 1992 is not required to have direction-indicators that comply with the requirements of Table 17.41.

17.42 Direction-indicator lamp sources

17.42.1

A filament bulb or LED array direction-indicator lamp fitted to a low volume vehicle, other than one built or modified before January 1992, must comply with any one or more of the approved standards specified for direction-indicator lamps listed in Table 17.2, by either incorporating the applicable standards markings on the direction-indicator lamp lens, or through other supplementary documented evidence. (see Table 17.2)

17.42.2

A filament bulb or LED array direction-indicator lamp fitted to a low volume vehicle, other than one built or modified before January 1992, that does not meet any one or more of the approved standards listed in Table 17.2, may be fitted provided that the lamp meets the requirements specified in Table 17.3.

A low volume vehicle built or modified before January 1992 is not required to have direction-indicator lamps that comply with an approved standard, or that meet the requirements of Table 17.3.

Forward-facing position-lamp (park) requirements

17.43 Number of forward-facing position-lamps

17.43.1

A low volume vehicle must be fitted with one pair of forward-facing position-lamps.

17.44 Colour of forward-facing position-lamps

17.44.1

When operated, a forward-facing position-lamp fitted to a low volume vehicle must emit diffuse light that is substantially white or amber.

17.45 Positioning of forward-facing position-lamps

17.45.1

A pair of forward-facing position-lamps fitted to a low volume vehicle must be:

(a) *positioned at the front of the vehicle; and*

(b) *symmetrically arranged.*

17.45.2

A pair of forward-facing position-lamps fitted to a low volume vehicle, other than one built or modified before January 1992, must be positioned at a width and height that is in accordance with the requirements specified in Table 17.1. (see Table 17.1)

17.46 Size of forward-facing position-lamps

17.46.1

A forward-facing position-lamp fitted to a low volume vehicle must incorporate a luminous lens surface area of not less than:

(a) *in the case of a filament bulb, 22 sq cm (3 ½ sq "); or*

(b) *in the case of an LED array, sufficient area to provide at least equivalent conspicuousness as a filament bulb specified in 17.46.1(a).*

17.47 Operation of forward-facing position-lamps

17.47.1

A forward-facing position-lamp fitted to a low volume vehicle may be either:

(a) *an individual item of lighting equipment; or*

(b) *a lamp that is incorporated as part of the headlamp assembly.*

17.48 Electrical connections for forward-facing position-lamps

17.48.1

A forward-facing position-lamp that is fitted to a low volume vehicle must automatically operate if the headlamps are activated.

17.48.2

Forward-facing position-lamps fitted to a low volume vehicle must operate simultaneously with the rearward-facing position-lamps, through a single and common activation.

17.49 Visibility (output) of forward-facing position-lamps

17.49.1

A forward-facing position-lamp fitted to a low volume vehicle must, when in operation, provide an output of not less than:

(a) *in the case of a filament bulb, 5 watts; or*

(b) *in the case of an LED array, equivalent brightness to a 5 watt filament bulb forward-facing position-lamp.*

17.49.2

A forward-facing position-lamp fitted to a low volume vehicle must emit light that is clearly visible from a distance of 200 m (656') during the hours of darkness.

17.50 Visibility (angles) of forward-facing position-lamps

17.50.1

A forward-facing position-lamp fitted to a low volume vehicle, other then one built or modified after January 1992, must, when operated, emit light that is visible within an angle of at least:

(a) *on a horizontal plane passing through the lamp:*

(i) *15 degrees above; and*

(ii) *15 degrees below;*

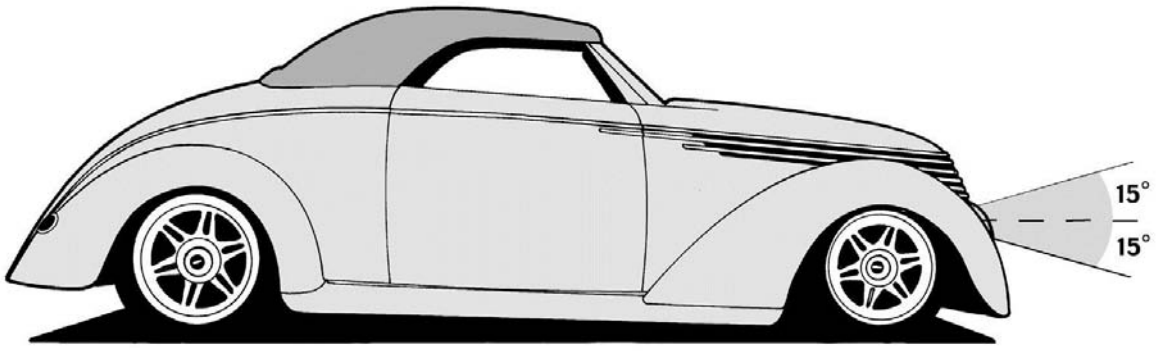
and

(b) *on a vertical plane that is parallel to the longitudinal centre-line of the vehicle, and passing through the lamp:*

(i) *45 degrees inboard; and*

(ii) *80 degrees outboard, or in the case of a vehicle manufactured before 1970, or whose body replicates a vehicle manufactured before 1970, and the design of the body makes achieving an 80-degree outboard visibility angle impractical, 45 degrees. (see Diagram 17.3)*

A low volume vehicle built or modified before January 1992 is not required to have forward-facing position-lamps that meet the requirements of 17.50.1.



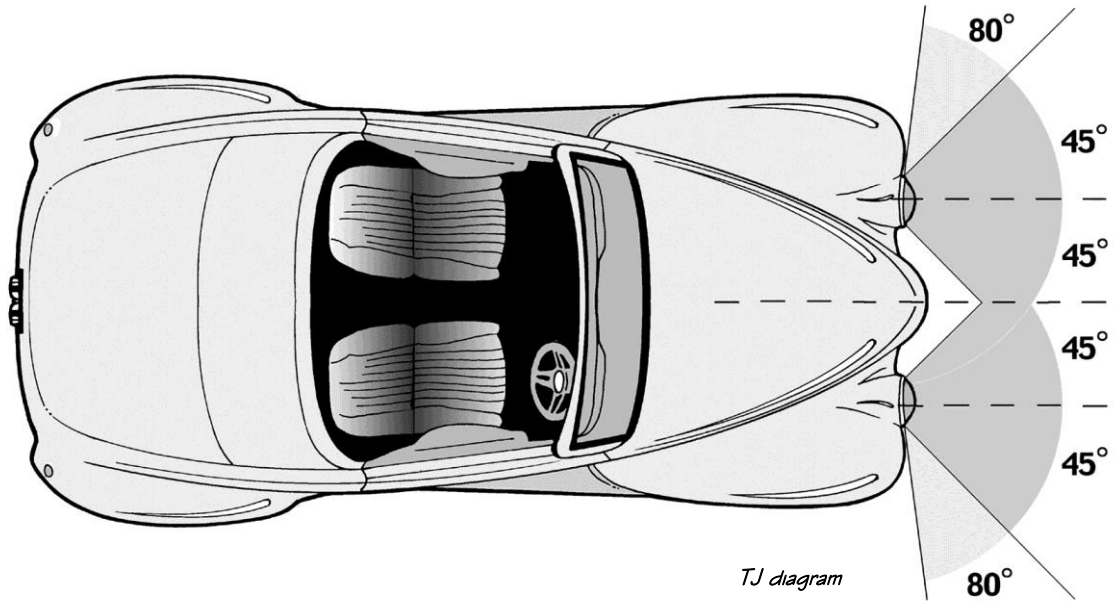


Diagram 17.3 Visibility angles for forward-facing position-lamps

17.51 Forward-facing position-lamp sources

17.51.1

A filament bulb or LED array forward-facing position-lamp fitted to a low volume vehicle, other than one built or modified before January 1992, must comply with any one or more of the approved standards specified for forward-facing position-lamps listed in Table 17.2, by either incorporating the applicable standards markings on the forward-facing position-lamp lens, or through other supplementary documented evidence. (see Table 17.2)

17.51.2

A filament bulb or LED array forward-facing position-lamp fitted to a low volume vehicle, other than one built or modified before January 1992, that does not meet any one or more of the approved standards listed in Table 17.2, may be fitted provided that the lamp meets the requirements specified in Table 17.3.

A low volume vehicle built or modified before January 1992 is not required to have forward-facing position-lamps that comply with an approved standard, or that meet the requirements of Table 17.3.

Rearward-facing position-lamp (tail) requirements

17.52 Number of rearward-facing position-lamps

17.52.1

A low volume vehicle must be fitted with one or two pairs of rearward-facing position-lamps.

See the 'Rearward-facing position-lamp exclusions' in 17.83 at the back of this chapter for those vehicles which may be fitted with a single rearward-facing-position lamp.

17.53 Colour of rearward-facing position-lamps

17.53.1

When operated, a rearward-facing position-lamp fitted to a low volume vehicle must emit diffuse light that is substantially red.

17.54 Positioning of rearward-facing position-lamps

17.54.1

A pair of rearward-facing position-lamps fitted to a low volume vehicle must be positioned at the rear of the vehicle, and symmetrically arranged.

17.54.2

A pair of rearward-facing position-lamps fitted to a low volume vehicle, other than one built or modified before January 1992, must be positioned at a width and height that is in accordance with the requirements specified in Table 17.1.

17.55 Size of rearward-facing position-lamps

17.55.1

A rearward-facing position-lamp fitted to a low volume vehicle must incorporate a luminous lens surface area of not less than:

(a) *in the case of a filament bulb, 22 sq cm (3 ½ sq "); or*

(b) *in the case of an LED array, sufficient area so as to provide at least equivalent conspicuousness as a filament bulb specified in 17.55.1(a).*

17.56 Electrical connections for rearward-facing position-lamps

17.56.1

A rearward-facing position-lamp that is fitted to a low volume vehicle must automatically operate if the headlamps are activated.

17.56.2

Rearward-facing position-lamps fitted to a low volume vehicle must operate simultaneously with the forward-facing position-lamps and the headlamps, through a single and common activation.

17.57 Visibility (output) of rearward-facing position-lamps

17.57.1

A rearward-facing position-lamp fitted to a low volume vehicle must, when in operation, provide an output of not less than:

(a) *in the case of a filament bulb, 5 watts; or*

(b) *in the case of an LED array, equivalent brightness to a 5 watt filament bulb rearward-facing position-lamp.*

17.57.2

A rearward-facing position-lamp fitted to a low volume vehicle must emit light that is clearly visible from a distance of 200 m (656') during the hours of darkness.

17.58 Visibility (angles) of rearward-facing position-lamps

17.58.1

A rearward-facing position-lamp fitted to a low volume vehicle, other than one built or modified before January 1992, must, when operated, emit light that is visible within an angle of at least:

(a) *on a horizontal plane passing through the lamp:*

(i) *15 degrees above; and*

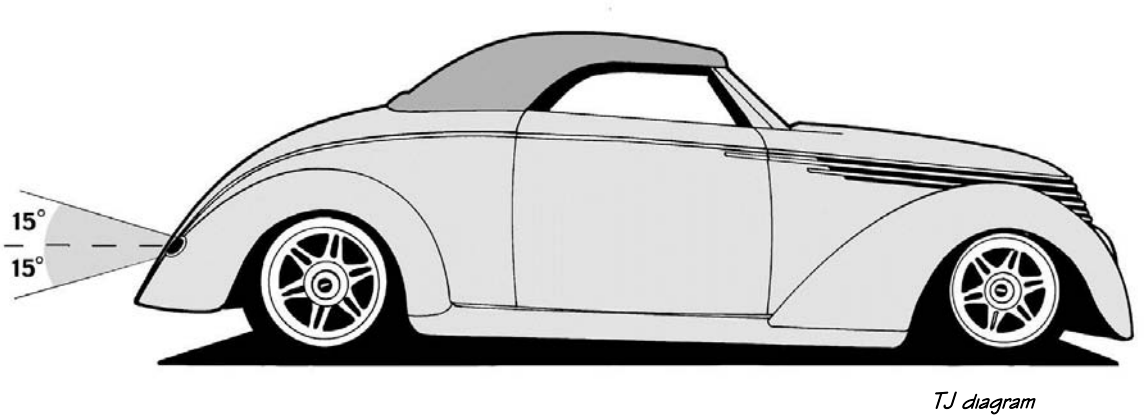
(ii) *15 degrees below;*

and

(b) *on a vertical plane that is parallel to the longitudinal centre-line of the vehicle, and passing through the lamp:*

(i) *45 degrees inboard; and*

(ii) *80 degrees outboard, or in the case of a vehicle manufactured before 1970, or whose body replicates a vehicle manufactured before 1970, and the design of the body makes achieving an 80-degree outboard visibility angle impractical, 45 degrees. (see Diagram 17.4)*



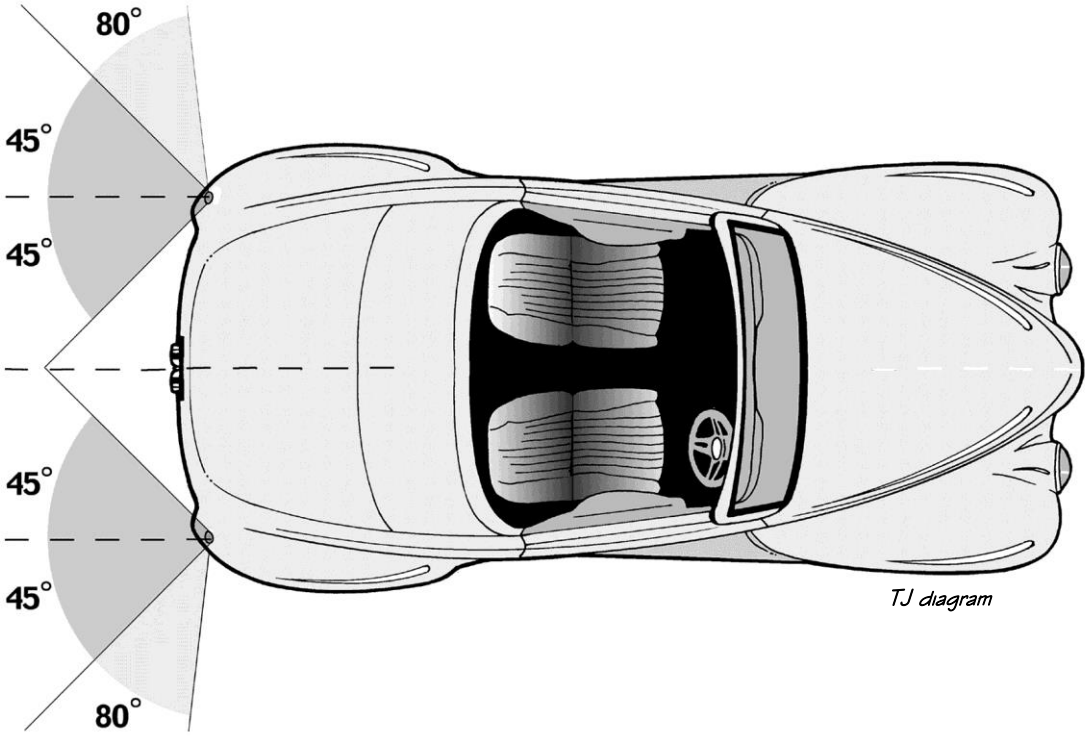


Diagram 17.4 Visibility angles for rearward-facing position-lamps

A low volume vehicle built or modified before January 1992 is not required to have rearward-facing position-lamps that meet the requirements of 17.58.1.

17.59 Rearward-facing position-lamp sources

17.59.1

A filament bulb or LED array rearward-facing position-lamp fitted to a low volume vehicle, other than one built or modified before January 1992, must comply with any one or more of the approved standards specified for rearward-facing position-lamps listed in Table 17.2, by either incorporating the applicable standards markings on the rearward-facing position-lamp lens, or through other supplementary documented evidence. (see Table 17.2)

17.59.2

A filament bulb or LED array rearward-facing position-lamp fitted to a low volume vehicle, other than one built or modified before January 1992, must comply with that does not meet any one or more of the approved standards listed in Table 17.2, may be fitted to a low volume vehicle provided that the lamp meets the requirements specified in Table 17.3.

A low volume vehicle built or modified before January 1992 is not required to have rearward-facing position-lamps that comply with an approved standard, or that meet the requirements of Table 17.3.

17.60 Blue-dot inserts for rearward-facing position-lamps

17.60.1

A rearward-facing position-lamp fitted to a low volume vehicle must not incorporate a blue-dot accessory insert within the lamp lens.

Rear registration-plate illumination-lamp requirements

17.61 Number of rear registration-plate illumination-lamps

17.61.1

A low volume vehicle must be fitted with at least one rear registration-plate illumination-lamp.

17.62 Colour of rear registration-plate illumination-lamps

17.62.1

When operated, a rear registration-plate illumination-lamp fitted to a low volume vehicle must emit diffuse light that is substantially white.

17.63 Positioning of rear registration-plate illumination-lamps

17.63.1

A rear registration-plate illumination-lamp that is fitted to a low volume vehicle must be positioned so as to illuminate the figures and letters of the rear registration-plate.

17.64 Electrical connections for rear registration-plate illumination-lamps

17.64.1

A rear registration-plate illumination-lamp fitted to a low volume vehicle must automatically operate if the headlamps are activated.

17.65 Visibility of rear registration-plate illumination-lamps

17.65.1

When operated, the light source of a rear registration-plate illumination-lamp fitted to a low volume vehicle must not be directly visible to the rear of the vehicle.

17.65.2

When operated, a rear registration-plate illumination-lamp fitted to a low volume vehicle must illuminate the figures and letters of a rear registration-plate so that they are visible during the hours of darkness from a distance of 20 m (66').

17.66 Rear registration-plate illumination-lamp sources

17.66.1

A filament bulb or LED array rear registration-plate illumination-lamp fitted to a low volume vehicle, other than one built or modified prior to January 1992, must comply with any one or more of the approved standards specified for registration-plate illumination-lamps listed in Table 17.2, by either incorporating the applicable standards markings on the rear registration-plate illumination-lamp lens, or through other supplementary documented evidence. (see Table 17.2)

17.66.2

A filament bulb or LED array rear registration-plate illumination-lamp fitted to a low volume vehicle, other than one built or modified prior to January 1992, that does not meet any one or more of the approved standards listed in Table 17.2, may be fitted provided that the lamp meets the requirements specified in Table 17.3.

A low volume vehicle built or modified before January 1992 is not required to have a rear registration-plate illumination-lamp that complies with an approved standard, or that meets the requirements of Table 17.3.

Retro-reflector lamp (reflector) requirements

17.67 Number of retro-reflectors

17.67.1

A low volume vehicle must be fitted with at least one pair of rearward-facing retro-reflectors.

17.68 Colour of retro-reflectors

17.68.1

A rearward-facing retro-reflector fitted to a low volume vehicle must reflect any white light shining on it as substantially red light.

17.68.2

A forward-facing retro-reflector, if fitted, to a low volume vehicle must reflect any white light shining on it as substantially white or amber light.

17.69 Positioning of retro-reflectors

17.69.1

A pair of rearward-facing retro-reflectors fitted to a low volume vehicle must be:

(a) *positioned at the rear of the vehicle; and*

(b) *symmetrically arranged.*

17.69.2

A pair of retro-reflectors fitted to a low volume vehicle must be positioned at a width and height that is in accordance with the requirements specified in Table 17.1.

17.70 Size of retro-reflectors

17.70.1

A retro-reflector fitted to a low volume vehicle must incorporate a luminous lens surface area of not less than 22 sq cm (3 ½ sq ").

17.70.2

A retro-reflector fitted to a low volume vehicle may be either:

(a) *an individual item of lighting equipment; or*

(b) *incorporated within the rearward-facing position-lamp.*

17.71 Visibility of retro-reflectors

17.71.1

A retro-reflector fitted to a low volume vehicle must reflect light to improve the visibility of the vehicle to other road users, without causing them undue dazzle or discomfort.

17.72 Retro-reflector sources

17.72.1

A retro-reflector fitted to a low volume vehicle, other than one built or modified before January 1992, must comply with any one or more of the approved standards specified for retro-reflectors listed in Table 17.2, by either incorporating the applicable standards markings on the retro-reflector, or through other supplementary documented evidence. (see Table 17.2)

A low volume vehicle built or modified before January 1992 is not required to have retro-reflectors that comply with an approved standard.

17.72.2

A retro-reflector that does not meet an approved standard specified in Table 17.2 may be fitted to a low volume vehicle provided it:

(a) *either:*

(i) *was fitted to a production vehicle as original equipment when the vehicle was manufactured; or*

(ii) *is manufactured from glass, by an aftermarket lamp manufacturer as a direct replacement for an original equipment lamp fitted to a production vehicle;*

and

(b) *the production vehicle for which the lamp is manufactured is a later model vehicle than the low volume vehicle to which the lamp is fitted, or in the case of a scratch-built low volume vehicle, the vehicle being replicated.*

17.72.2(b)

This requires that where a retro-reflector from a production vehicle is fitted, the retro-reflector must always be from a later-model vehicle, and not an older vehicle, so that the retro-reflector performance of the modified vehicle is always increased and not decreased, as a result of the fitment.

17.72.3

A retro-reflector that is custom-manufactured may be fitted to a low volume vehicle, provided that either:

(a) *the retro-reflector is:*

(i) *part of a retro-reflector, or lens that incorporates a retro-reflector, that was fitted as original equipment to a production vehicle; and*

(ii) *meets one or more of the approved standards specified in Table 17.2;*

or

(b) *in the case of a retro-reflector custom-manufactured from sheet material, documented evidence is provided to the LVV Certifier to substantiate that the optical properties and ultra-violet light resistance of the sheet material is acceptable.*

7.72.3(a)(i)

If a retro-reflector is custom-made from a part of an OE lamp from a production vehicle, and the custom-made retro-reflector does not incorporate the approved standards markings from the OE lens, the remainder of the OE lens from which the custom-made retro-reflector is cut should be retained and made available to the LVV Certifier in order to verify to the LVV Certifier the origin of the custom-made lens.

17.72.3(b)

Where 17.72.3(b) applies, LVVTA should be consulted to confirm the suitability of the material.

Optional lamp requirements

17.73 Cosmetic lamp requirements

17.73.1

A low volume vehicle that is fitted with cosmetic lamps must meet the applicable requirements of LVVTA LVV Standard 125-00 (Lighting Equipment).

17.73.1

'Cosmetic lamps' are, in effect, any lamp not covered in this chapter.

This LVV Standard is available free of charge from the LVVTA website, www.lvvta.org.nz

17.74 Interior lamps

17.74.1

A low volume vehicle is not required to be fitted with an interior lamp, however one or more interior lamps serving to light the interior of a low volume vehicle for the convenience of passengers may be fitted, in which case they must not, when in use whilst the vehicle is in motion:

(a) *adversely affect the driver's vision; or*

(b) *cause undue dazzle or discomfort to other road users.*

17.75 Daytime running-lamps

17.75.1

A low volume vehicle is not required to be fitted with daytime running-lamps, however one pair of daytime running-lamps may be fitted to the front of the vehicle, in which case they must:

(a) meet one or more of the approved standards specified for daytime running-lamps listed in Table 17.2; and

(b) *when operated, emit light that is substantially white or amber; and*

(c) *not operate when a front fog-lamp or headlamp is in use.*

17.76 Reversing-lamps

17.76.1

A low volume vehicle is not required to be fitted with reversing-lamps, however one or two reversing-lamps may be fitted to the rear of the vehicle, in which case they must:

(a) meet one or more of the approved standards specified for reversing-lamps listed in Table 17.2; and

(b) *emit light that is substantially white; and*

(c) *emit a diffuse light or a dipped beam of light; and*

(d) *be able to be operated only when either the reverse gear is engaged, or the headlamps are extinguished.*

17.77 Cornering-lamps

17.77.1

A low volume vehicle is not required to be fitted with cornering-lamps, however one pair of cornering-lamps may be fitted for use when cornering, provided that:

(a) *the cornering-lamps are fitted by a high volume vehicle manufacturer when the vehicle is manufactured; and*

(b) *when operated, the cornering-lamps emit light that is substantially white or amber; and*

(c) *the vehicle is not modified in a way that affects the performance of the cornering-lamps.*

17.78 Fog-lamps

17.78.1

A low volume vehicle is not required to be fitted with one or more fog-lamps, however, if fitted, fog-lamps must:

(a) meet one or more of the approved standards specified for fog-lamps listed in Table 17.2; and

(b) *comply with the technical requirements specified for fog-lamps in the New Zealand Transport Agency Vehicle Inspection Requirements Manual for In-Service Vehicles.*

17.78.1(b)

The NZTA Vehicle Inspection Requirements Manual is what the Warrant of Fitness issuers use, and the information contained within it can be obtained from an LVV Certifier.

17.78.2

A front fog-lamp fitted to a low volume vehicle may be covered by a readily removable protective cover when it is not in use.

17.79 Moveable spot-lamps

17.79.1

A low volume vehicle may be fitted with a moveable spot-lamp, provided that:

(a) *the vehicle to which the spot-lamp is fitted is a production vehicle manufactured before 1960; and*

(b) *the spot-lamp was a factory or aftermarket accessory available at the time of the vehicle's manufacture.*

17.80 Decorative hood ornament-lamps

17.80.1

A low-wattage decorative-lamp may be incorporated within a hood ornament fitted to a low volume vehicle, provided that:

(a) *the vehicle to which the hood ornament is fitted is a production vehicle; and*

(b) *the hood ornament was a factory or aftermarket accessory available at the time of the vehicle's manufacture.*

17.80.1

A low-wattage decorative hood ornament-lamp may only be fitted to a vehicle for which a valid Vintage Car Club of New Zealand 'Lighting Equipment Endorsement' is issued.

17.81 Towing-lamps

17.81.1

A low volume vehicle may be fitted with a roof-mounted blue-lens towing-lamp, provided that:

(a) *the vehicle to which the towing-lamp is fitted is a production vehicle manufactured prior to 1960; and*

(b) *the towing-lamp is not operational.*

17.81.1

A blue roof-mounted towing-lamp was a common new car dealer-installed accessory during the 1940s to 1960s, to signal to other motorists that a trailer was being towed.

Exclusions:

17.82 Motor-sport exclusions

17.82.1

A low volume vehicle that is issued with a valid LVV Authority Card issued by MotorSport New Zealand is not required to meet the requirements of 17.6.2, provided that:

(a) *the additional headlamps are used only in competition events that are closed to the motoring public; and*

(b) *the additional headlamps can be disconnected from the regulatory main-beam and dipped-beam headlamps by a circuit-breaker that is within easy reach of the driver.*

17.83 Single rearward-facing position-lamp and stop-lamp exclusions

17.83.1

A low volume vehicle is not required to meet the requirements of 17.8.1 and 17.52.1, and may be fitted with a single rearward-facing position-lamp and a single stop-lamp, positioned at, or to the right of, the longitudinal centreline of the vehicle, if the vehicle either:

(a) *is less than 1.5 m (5') in width; or*

(b) *was manufactured before 1 January 1978; and*

(i) *was originally equipped with only one rearward-facing position-lamp and one stop-lamp by the vehicle manufacturer; and*

(ii) *the vehicle's performance characteristics have not been substantially enhanced from its as-manufactured condition.*

17.84 Direction-indicator lamp exclusions

17.84.1

A low volume vehicle is not required to be fitted with direction-indicators, and therefore does not have to be fitted with direction-indicators as specified in 17.34.1 if the vehicle:

(a) *was manufactured before 1 January 1967; and*

(b) *was not originally equipped with direction-indicators by the vehicle manufacturer; and*

(c) *the vehicle's performance characteristics have not been substantially enhanced from its as-manufactured condition.*