

Vehicle Standards Bulletin 14

**NATIONAL CODE OF PRACTICE
for
LIGHT VEHICLE CONSTRUCTION
and
MODIFICATION**

**SECTION LH
BODY AND CHASSIS**

VERSION 2.0 JANUARY 2011

Vehicle Standards Bulletin 14

National Code of Practice for Light Vehicle Construction and Modification (VSB 14)

Important Information for Users

Users of VSB 14 need to be aware that this document needs to be used in conjunction with the appropriate administrative requirements of the jurisdiction in which they wish to either register a vehicle or to obtain approval for a modification for an already registered vehicle. *Administrative requirements* include, amongst other things, processes for vehicle registration, obtaining exemptions, obtaining modification approvals, vehicle inspections, preparation and submission of reports and the payment of appropriate fees and charges.

If unsure of any of the requirements specified in VSB 14, or if more information is needed for any other issues concerning the administrative requirements, users should contact their relevant Registration Authority **prior** to commencing any work.

While VSB 14 provides advice on the construction of Individually Constructed Vehicles (ICVs) and the execution of modifications, it is not to be taken to be a design manual. Determination of component strength, performance, suitability and functionality must be either calculated or determined on a case by case basis by suitably qualified personnel experienced in each matter under consideration.

Users of VSB 14 also need to ensure that they refer to the most recent version of the relevant Section/s when working on a project. The version is identified by the version number and date on the face page of each Section. The version and date is also located in the footer of each page in each Section. On the website the version number is specified in the Section file name for easy identification.

If a project is taking a long time to complete, check the currency of the version you are using.

Users must be familiar with the provisions stated in the Preface and Introduction. These two Sections provide the necessary background information to assist users in understanding how VSB 14 is administered by Registration Authorities across Australia, on how it is structured, and the meaning of the types of modification codes specified in VSB 14. If not already done so, users should download them for study and reference.

Understanding these requirements is important to ensure that the correct processes are followed thereby reducing the likelihood of having work rejected by Registration Authorities.

Many of the Sections refer to other Sections within VSB 14 for further information or additional requirements. Users must read and apply all relevant Sections.

If in doubt about any issue concerning or contained in VSB 14, users should seek clarification from the appropriate State or Territory Registration Authority.

Please do not contact Vehicle Safety Standards (VSS) of the Australian Government Department of Infrastructure and Transport in Canberra about VSB 14. VSS provides the website as a service only.

Document Amendments by Version

Version

Amendments

Version 2

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Padding in mandatory locations now must comply with the padding specifications detailed in Section *LZ Appendices*.

A new Code titled *Code LH11 Campervan, Motorhome Conversion* has now been added.

This document also has a number of editorial amendments that have had no effect on its technical content.

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1 SCOPE

Section LH outlines the minimum design, construction, installation and performance requirements for the following body and chassis modifications for light vehicles.

1.1 BASIC MODIFICATIONS NOT REQUIRING CERTIFICATION

The following *basic modifications* do not require certification under the LH Codes, if they are carried out in accordance with the requirements specified in sub-section 2 *General Requirements* and sub-section 4 *Modifications Without Certification*.

- Bonnet scoops and projections;
- Bonnet pins and mascots;
- Customised and replacement panels;
- Inner mudguard modifications; and
- Glass and surface films.

1.2 MODIFICATIONS AND CONSTRUCTION REQUIRING CERTIFICATION UNDER LH CODES

The following modifications may be performed under the LH Codes:

- Conversion of a vehicle by removing or modifying the roof, e.g. convertible conversion;
- Conversion of a vehicle by extending or reducing the wheelbase, e.g. *stretched limousine*;
- Construction of a vehicle using at least the chassis or body from a production vehicle, e.g. Holden station wagon body on a Landcruiser chassis;
- Conversion of a vehicle to a different model variant, e.g. station wagon to utility conversion; and
- Tilt-fronts.

2 GENERAL REQUIREMENTS

This subsection applies to all light vehicles and must be read and applied in conjunction with all the LH Codes applicable to the proposed modifications.

Modified vehicles must continue to comply with the Australian Design Rules (ADRs) to which they were originally constructed, except as allowed for in the Australian Vehicle Standards Rules (AVSR). These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

Compliance with the AVSR also means compliance with the equivalent regulations of a State or Territory of Australia.

2.1 OCCUPANT PROTECTION

As part of the modifications undertaken to a vehicle's body or chassis, modifications may also be required to its interior such as the installation of glass partitions, the removal of dangerous protrusions and the installation of seatbelts, seats or head restraints. These additional modifications must not compromise compliance with the ADRs applicable to the vehicle and must not increase the risk to the vehicle's occupants. Refer to Section LK *Seating and Occupant Protection* for more information.

2.2 MECHANICAL

2.2.1 Component Strength

Suspension, braking, axle and steering components and tyres must not be over-loaded due to increased vehicle mass as a result of any vehicle modifications such as extensions to the wheelbase, additional seating etc. Where standard components are not designed to handle the increased loading due to a modified vehicle's increased Gross Vehicle Mass (GVM), the standard components must be upgraded or replaced with components of a higher rating as appropriate.

2.2.2 Vehicle Mass (Weight)

Where a conversion has resulted in an increase in tare mass, the modified vehicle must be weighed at a weighbridge. Individual axle masses and total mass must be recorded separately.

Where the original GVM of the vehicle is no longer applicable due to the modifications performed, a new GVM must be determined.

For light trucks and commercials, refer to Vehicle Standards Bulletin 6, *Heavy Vehicle Modifications – National Code of Practice (VSB 6)* – Section S Codes.

2.2.3 Tyre Load Capacity

Tyre load ratings must be adequate for any resultant increase in individual axle loadings or GVM following the modification. If the tyre ratings listed on the original tyre placard are no longer suitable, a new tyre placard must be fitted to the vehicle that specifies the appropriate size, load capacity and speed rating of the tyres and the suitable width and diameter of rims. The placard must be clearly legible and manufactured from a durable material.

2.3 GLAZING

Requirements for safety glazing materials for windscreens, windows and internal partitions, together with information on window tinting by means of applied surface films, are contained in Section LZ *Appendices, Appendix G Safety Glazing Material and Applied Window Tinting*.

2.4 DRIVEABILITY

Driveability in this context means that, when driven on the road, the vehicle responds to the driver's inputs without any dangerous or undesirable reactions and meets the turning and clearance requirements of the AVSR.

2.4.1 Turning Circle

All vehicles must have a turning circle in each direction, as determined by reference to the extreme outer edge of the tyre track at ground level, not exceeding 25m in diameter.

2.4.2 Ground Clearance and Running Clearance

Ground clearance of a vehicle means the minimum distance to the ground from a point on the underside of the vehicle, except a point on a tyre, wheel, wheel-hub, brake backing plate or flexible mudguard or mudflap of the vehicle.

Running clearance of a vehicle means the distance from the surface on which an unladen vehicle is standing to the lowest point on the vehicle excluding unsprung mass.

Vehicles built to comply with the Third Edition ADRs must comply with the ground clearance requirements of ADR 43/.... Vehicles built to comply with ADR 43/04 must also comply with the *running clearance* requirements.

All other motor vehicles with more than 3 wheels must have a ground clearance of:

- at least 100mm at any point within 1 metre of an axle; and
- at least one-thirtieth of the distance between the centres of adjacent axles at the midpoint between them; and
- at any other point — at least the distance that allows the vehicle to pass over a peak in the road with a gradient on either side of 1:15, if the wheels of one axle of the vehicle are on the slope on one side of the peak and the wheels of the next axle are on the slope on the other side.

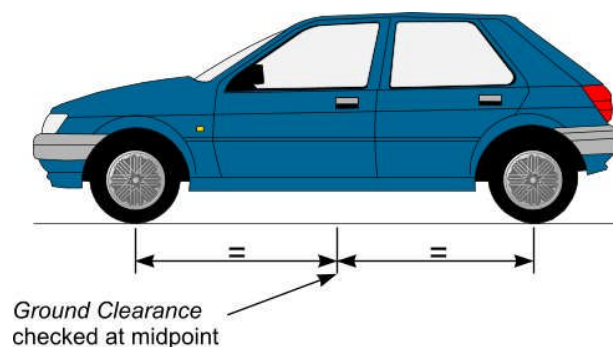


Figure LH1: Measuring *Ground Clearance*

2.4.3 Field of View

Where the visibility (field of view) requirements for the internal rear vision mirror can no longer be met, there must be an external mirror on either side of the vehicle that provides the driver with a clear view to the rear.

2.4.4 Roadholding and Handling

The roadholding and handling qualities of a modified vehicle must not exhibit any undesirable handling or braking characteristics. Similarly, an ICV must have roadholding and handling qualities appropriate to its purpose and overall design, e.g. its engine power, size, mass and suspension.

2.4.5 Vibration

The vehicle must not exhibit any excessive vibration.

2.5 BRAKES

Vehicles originally manufactured to comply with ADR 31/... must continue to do so following modifications. A modified vehicle or ICV must exhibit stable and effective braking across the full range of application of the brakes and meet the requirements of Code LG.

2.6 FABRICATION

All work must be performed in accordance with recognised engineering standards. Cutting, heating, welding or bending of components should be avoided by choosing unmodified production components wherever possible.

2.6.1 Welding, Fasteners and Electroplating

Mandatory requirements and guidance on the above items are contained in Section LZ *Appendices*.

- For the use of fasteners refer to Appendix A *Fasteners*;
- For welding techniques and procedures refer to Appendix C *Heating and Welding of Steering Components*; and
- For electroplating refer to Appendix D *Electroplating*.

2.7 FIBREGLASS

2.7.1 Strength and Thickness

The thickness, of *non-intrusion* panels, with gel coat removed, must be at least 3.5mm. Bonnets and guards are examples of *non-intrusion* panels.

The strength and thickness of structural components such as floorpans and bodies that incorporate seatbelt anchorages, door hinges and latches etc., must be certified by a signatory.

The fixings for replacement fibreglass panels should have the same positions and must have at least the same strength as the fixings used for the original panels. A combination of steel and neoprene washers of a minimum 20mm diameter should be used with all fixings.

Seat and seatbelt anchorages, door hinges and latches must only be affixed to fibreglass panels, floorpans or bodies that have been reinforced to take the loads such components are capable of generating both in normal use and in a crash.

2.7.2 Testing of Fibreglass Structural Components

All fibreglass used in structural components must comply with and be tested in accordance with the requirements of British Standard 2782 Part III, methods 320E and 335A. The test panels must reach minimum acceptance levels of 85 MPa in tension and 152 MPa in flexure. The Barcol hardness value must be greater than 25 and the fibre to weight ratio must be at least 0.29.

Fibreglass panels presented for testing should be laid up under supervision in order to verify the consistency of lay up when referenced to the vehicle components being constructed. These

test panels should measure approximately 600mm x 600mm and be free of gel coat. Flat (planar) test panels are required to comply with test procedures.

Testing must be carried out by a NATA certified testing laboratory.

Where the modifier has quality management processes accredited to ISO AS/NZS 9000, testing of the components need only be done once to prove the general design.

2.8 FOAM PADDING FOR OCCUPANT PROTECTION

Wherever foam padding is specified in this Section, the padding must meet the padding specifications detailed in Appendix B *Foam Padding for Occupant Protection* in Section LZ *Appendices*.

3 AUSTRALIAN DESIGN RULES

3.1 ADR REQUIREMENTS

A modified vehicle must continue to comply with the ADRs, to which it was originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

3.2 CERTIFICATION

Certification of compliance of vehicles with the ADRs is required where specifically stated in the relevant Code in sub-section 5.

3.3 IDENTIFICATION PLATES (COMPLIANCE PLATES)

An Identification Plate authorised by the Australian Motor Vehicle Certification Board or the Department of Infrastructure and Transport (DIT) is required for production vehicle registration in all Australian States and Territories. Vehicles may also be registered if they have been issued with a permit or an exemption from the installation of an Identification Plate.

3.4 COMPLIANCE AFTER MODIFICATION

Outlined in Table LH1 below are requirements and/or components of the vehicle that may be affected by the modifications and that may require re-certification, testing and/or data to show continuing compliance for the modified vehicle. This is not an exhaustive list and other modifications may also affect ADR compliance.

Table LH1 Summary of items that if modified, may detrimentally affect compliance with applicable ADRs

ADR	Title
3x, 3/...	Seat and Seat Anchorages
4x, 4/...	Seatbelts
5x, 5/...	Anchorages for Seatbelts and Child Restraints
8, 8/...	Safety Glazing Material
10x, 10/...	Steering Column
11, 11/...	Internal Sun Visors
13/...	Installation of Lighting and Light Signalling Devices on Vehicles other than L-group Vehicles
19/...	Installation of Lighting and Light-Signalling Devices on L-group Vehicles
22x, 22/...	Head Restraints
29, 29/...	Side Door Strength
31, 31/...	Hydraulic Brake Systems for Passenger Cars
34x, 34/...	Child Restraint Anchorages and Child Restraint Anchor fittings
42/...	General Safety Requirements
43/...	Vehicle Configuration and Dimensions
60	Centre High-mounted Stop Light
69	Full Frontal Impact Occupant Protection
72	Dynamic Side Impact Occupant Protection
73	Offset Frontal Impact Occupant Protection

To determine the ADRs that apply to the vehicle in question, refer to the applicability table in Section LO. Vehicles manufactured on or after 1 January 1969 and prior to 1 July 1988 need to comply with the Second Edition ADRs whilst vehicles manufactured after this date need to comply with the Third Edition ADRs. Section LO has separate applicability tables for each edition.

Alternatively, ADR applicability tables for individual vehicle categories may be referenced on the Department of Infrastructure and Transport *RVCS* website at the following address and under the section titled *ADR Applicability Tables*:

<http://rvcs.dotars.gov.au/>

The ADRs apply according to the vehicle's category and date of manufacture. It is the responsibility of the signatory to refer to the appropriate ADR applicable to the vehicle.

4 BASIC MODIFICATIONS WITHOUT CERTIFICATION

The following modifications may be carried out without certification under an LH Code, provided that the vehicle continues to comply with relevant ADRs and AVSR and provided that the vehicle meets the following general safety requirements.

4.1 BONNET SCOOPS AND PROJECTIONS

Modifications to the bonnet of a vehicle must take into account the possibility that a pedestrian or cyclist might strike the scoop or bonnet projection in a collision. The top surface of a scoop must not be more rigid than the original bonnet.

For vehicles manufactured prior to 1 July 1988, there are no specific design rule requirements relating to bonnet scoops. However any such fixture that is a dangerous protrusion or obstructs the driver's forward view of the road, is prohibited by both the ADRs and AVSR. For vehicles manufactured on or after 1 July 1988, ADR 42/... prohibits external or internal protrusions that are not technically essential and are likely to increase the risk of bodily injury to any person.

Rigid engine-mounted components that are likely to increase injuries to a pedestrian in a collision must not project through and above the vehicle's original bonnet profile, unless protected with a cover mounted to the bonnet.

Bonnet-mounted scoops must meet the following requirements:

- When a 165mm diameter sphere is placed on the bonnet in front of the scoop (or bonnet projection) and rolled rearwards until it touches the scoop, no point of contact between the sphere and the scoop must lie above a horizontal plane passing through the centre of the sphere (refer Figure LH2);

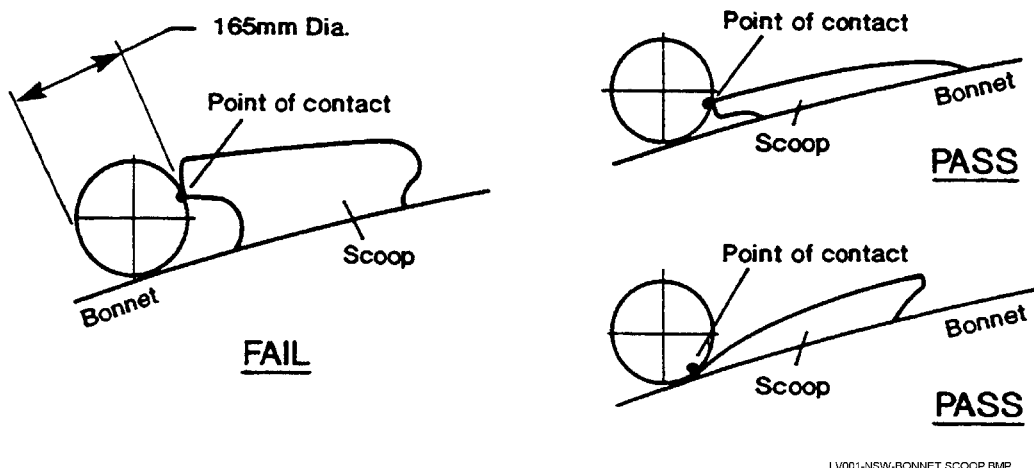


Figure LH2: Requirements for bonnet mounted scoops

- There is no maximum height specified for a bonnet scoop, however it must not restrict the field of view of the driver under normal operating conditions. The driver's field of view requirements are determined as follows:
 - When sitting in the driver's seat with the seat located at its rearmost position, it must be possible to see either the surface of the road, 11 metres in front of the driver's eye or the front edge of the original body when looking across the top of the bonnet scoop (refer Figure LH3); and
 - For the purposes of this requirement, the driver's eye position must lie at the bottom of the 95th percentile eye ellipse (refer ADR 15/01 clause 15.1.5.1). Alternatively, the eye position can be taken as being a point 730mm above and 270mm forward of the junction of the seat cushion and squab (back) with the seat in its lowest and rearmost position;

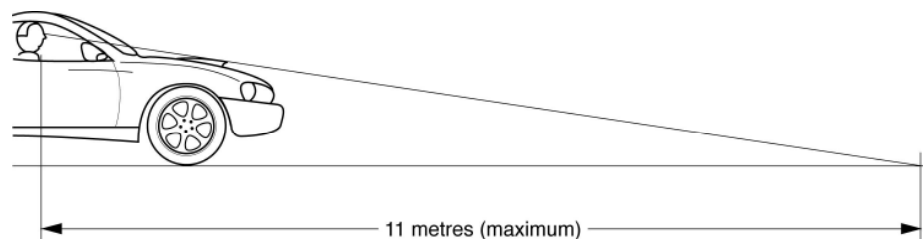


Figure LH3: Requirements for bonnet-mounted scoops

- The edges at the front of a scoop likely to contact a pedestrian in a collision must be well rounded with a minimum of 10mm radius;
- All edges and corners must have a radius of not less than 5mm and be of a general design and construction that reduces the risk of bodily injury to any person;
- The scoop must not have reflective surfaces that will cause glare towards the driver or other road users;
- A bonnet scoop manufactured from a plastic or fibreglass material may be fitted, providing that the hole in the original bonnet does not substantially reduce the strength or impact resistance of the bonnet and no rigid component, such as an air cleaner or carburettor, protrudes beyond the original bonnet profile;
- Holes may be cut in the bonnet to allow the protrusion of an air cleaner or carburettor above the bonnet line providing the protrusions remain underneath the bonnet scoop. In these circumstances, the bonnet scoop or raised bonnet section must be manufactured from mild steel of equivalent gauge to that of the original bonnet; and
- If any bonnet reinforcing braces are cut or modified, the design of the modified bonnet must be of equal strength to the original bonnet and any sharp edges created must be suitably treated.

4.2 BONNET PINS AND MASCOTS

4.2.1 General

For vehicles manufactured prior to 1 July 1988 there are no specific requirements for items such as bonnet pins and mascots. However fixtures that increase the risk of injury to other motorists or pedestrians are deemed to be dangerous protrusions and must not be used.

For vehicles manufactured on or after 1 July 1988, ADR 42/-- specifically prohibits external or internal protrusions that are not technically essential and are likely to increase the risk of bodily injury to any person.

4.2.2 Bonnet Pins

Bonnet pins that protrude through the bonnet must not be used. Bonnet securing devices that are flush with the contours of the bonnet may be used.

4.2.3 Mascots

Original equipment mascots fitted by the vehicle manufacturer for a particular make and model of vehicle or mascots that do not protrude outside the contours of the vehicle body, may be used.

4.3 CUSTOMISED AND REPLACEMENT PANELS

4.3.1 Customised Metal Panels

Body panels may be customised (e.g. to fit alternative lamps), provided that the structural integrity of the body is not adversely affected and the vehicle continues to comply with all relevant ADRs.

4.3.2 Fibreglass and Other Composite Replacement Panels

Original bolt-on metal bonnets and mudguards for pre 1971 (ADR 10) vehicles may be replaced with fibreglass or other composite panels that comply with sub-section 2.7, providing the modification does not increase the rigidity of the front structure of the vehicle and the collapsibility of the steering column on ADR 10 vehicle is not compromised.

The catches and/or the design of the replacement bonnet must prevent it from being propelled through the windscreen into the cabin area in the event of a frontal collision.

4.3.3 Mudguard Flares

Flared extensions may be added to original mudguards. There is no restriction on their design or size, however, the new section must be securely fixed, the ends tapered back to follow the body line of the vehicle and the exposed edges must have a radius of at least 5mm. The shape of flared mudguards must ensure that there is no likelihood of the tyres contacting the vehicle body or any other component under all operating conditions.

4.4 TILT-FRONTS ON PRE 1971 VEHICLES

Tilt-fronts are forward pivoting integral bonnet, grille and front mudguard assemblies for front-engine vehicles. Examples of production vehicles fitted with this type of engine access are the Jaguar 'E' Type and the Triumph Herald.

The fitting of tilt-fronts may affect vehicle lighting, field of view, seatbelts, seatbelt and child restraint anchorages and collapsibility of steering columns. However, if the modifications do not

increase the rigidity of the front structure of the vehicle, any adverse effects on seatbelts, seatbelt and child restraint anchorages and collapsibility of steering columns would be minimal.

The fitting of a tilt-front to a vehicle manufactured on or after 1 January 1971 is not covered by VSB 14 and the Registration Authority must be contacted for further information.

A tilt-front may be fitted to a pre 1971 (ADR 10) vehicle provided that:

- new body sections are designed and constructed with no dangerous or sharp projections that increase the risk of injury to other motorists, pedestrians or cyclists;
- new body sections do not obstruct the visibility of lamps fitted to the front of the vehicle and in particular, the direction indicator lamps and headlamps;
- new body sections do not obstruct the field of view of the driver when seated in the normal driving position. The modification must not restrict the field of view of the driver under normal operating conditions (refer to Figure LH2);
- with the driver's seat in the rearmost position, it is possible for the driver to see, unobstructed for the full width of the vehicle, a line drawn across the roadway 11 metres ahead of the driver's eye position when looking over the bonnet;
- for the purpose of this requirement the driver's eye position must lie at the bottom of the 95th percentile eye ellipse (refer ADR 15/01 clause 15.1.5.1). Alternatively, the driver's eye position can be taken as a point 730mm above and 270mm forward of the junction of the seat cushion and seat squab (back) with the seat in the lowest and rearmost position;
- anchoring, hinge and latching mechanisms are durable and are at least equal in strength to the hinge and latching mechanisms of the original vehicle;
- the catches and/or the design of the tilt-front must prevent the unit from being propelled rearwards through the windscreen into the cabin area in the event of a frontal collision;
- all lights and direction indicators incorporated in the tilt-front must continue to comply with the requirements of the AVSR;
- any wiring to lamps incorporated in the tilt-front is adequately supported and protected against chafing on surrounding components; and
- a collapsible steering column is fitted as part of the modifications.

4.5 INNER MUDGUARD MODIFICATION

Inner mudguards may be extended to form *wheel tubs* to accommodate larger wheels and tyres provided that:

- the vehicle structure is not weakened;
- seat anchorages or seatbelt anchorages are not weakened;
- body modifications are not undertaken within 200mm of any seat anchorage or seatbelt anchorage;
- the wheels or tyres do not protrude beyond the bodywork of the vehicle when viewed from above;

- the wheels or tyres do not contact any part of the vehicle's steering or suspension, brake lines or bodywork for the full range of suspension movement;
- the maximum allowable rim and tyre sizes are not exceeded;
- the maximum and minimum allowable track is not exceeded;
- there are no sharp or dangerous projections;
- the vehicle's maximum dimension limits are not exceeded; and
- the vehicle's ground clearance remains within legal limits.

Any replacement mudguard panels should use material of at least the same thickness as the surrounding body panels and should preferably be fully welded to the body on one side of the panel and stitch welded on the other. All joints must be sealed against the entry of exhaust fumes into the cabin and to prevent moisture getting between any overlapping panels.

Wheel tubs that require modifications to coil spring and shock absorber mounts cannot be used unless certified.

Where the installation requires modification or relocation of seat mountings, seatbelt mountings, structural sub-frames or chassis rails, the vehicle must be certified under Section LK *Seating and Occupant Protection* and Codes LH5 and LH6.

Vehicles built to ADR 69 and/or ADR 73 requirements are not covered by these requirements and must be certified under Codes LH5 and LH6.

4.6 GLASS AND SURFACE FILMS

Requirements for safety glazing materials for windscreens, windows and internal partitions, together with information on window tinting by means of applied surface films are contained in Section LZ *Appendices Appendix G Safety Glazing Material and Applied Window Tinting*.

5 CERTIFIED MODIFICATIONS (LH CODES)

This section specifies particular requirements and covers limitations on modifications carried out under individual LH Codes.

Each Code is supplemented with a checklist (refer to Table LH2).

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ROOF CONVERSION (DESIGN)

CODE LH1

SCOPE

Code LH1 provides for the preparation of designs that may be approved by Registration Authorities for use by other signatories or modifiers. Code LH1 provides for the design of roof conversions and the design of sun roof installations. The actual roof conversion or sun roof installation is covered by Code LH2.

Code LH1 does not apply to ADR category L-group vehicles and motor cycles.

DESIGNS COVERED UNDER CODE LH1

The following is a summary of the modifications that may be performed under Code LH1 - *Roof Conversion (Design)*.

- Conversion of vehicles of monocoque construction to convertibles or cabriolets;
- Conversion of vehicles with separate chassis to convertibles or cabriolets;
- Conversions of vehicles to a lower roof profile, roof removal (chop-top) or otherwise re-configuring the roof; and
- Installation of a sun roof.

DESIGNS NOT COVERED UNDER CODE LH1

Designs not covered under this Code include:

- Design of a completely new body on an existing chassis; and
- The actual physical modification of a vehicle (this is covered by Code LH2).

COMPLIANCE WITH APPLICABLE VEHICLE STANDARDS

Modified vehicles must continue to comply with the ADRs to which they were originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

Compliance with the AVSR also means compliance with the equivalent regulations of a State or Territory of Australia.

Outlined below in Table LH3 are areas of the vehicle that may be affected by the modifications and that may require re-certification, testing and/or data to show compliance for the modified vehicle. This is not an exhaustive list and other modifications may also affect ADR compliance.

Table LH3 Summary of items that if modified, may detrimentally affect compliance with applicable ADRs

DETAIL	REQUIREMENTS
Door Latches and Hinges	ADR 2, 2/...
Installation of Seats and Seat Anchorages	ADR 3x, 3/... VSB 5A, VSB 5B
Installation of Seatbelts and Seatbelt Anchorages	ADR 4x, 4/... ADR 5x, 5/... VSB 5A, VSB 5B
Child Restraint Anchorages	ADR 5/... ADR 34x, 34/... VSB 5A, VSB 5B
Safety Glazing Material	ADR 8, 8/...
Internal Sun Visors	ADR 11, 11/...
Rear Vision Mirrors	ADR 14, 14/...

To determine the ADRs that apply to the vehicle in question, refer to the applicability table in Section LO. Vehicles manufactured after 1 January 1969 and prior to 1 July 1988 need to comply with the Second Edition ADRs whilst vehicles manufactured after this date need to comply with the Third Edition ADRs. Section LO has separate applicability tables for each edition.

Alternatively, ADR applicability tables for individual vehicle categories may be referenced on the Department of Infrastructure and Transport *RVCS* website at the following address and under the section titled *ADR Applicability Tables*:

<http://rvcs.dotars.gov.au/>

The ADRs apply according to the vehicle's category and date of manufacture. It is the responsibility of the signatory to refer to the appropriate ADR applicable to the vehicle.

SPECIFIC REQUIREMENTS

The following are items that need to be considered for the certification of roof conversion designs under Code LH1.

The conversions must also comply with the general guidelines contained in sub-section 2 *General Requirements*.

1 STRENGTH AND SAFETY

Modification to a vehicle's roof structure that involves removal of the roof, roof support beams and cant rails can significantly reduce the strength and the safety of the vehicle. Most modern motor vehicles are constructed without a separate chassis and the majority of body panels and some glass panels are stressed to achieve the vehicle's required strength and stiffness.

2 BODY FLEXING

If the modifications significantly reduce the stiffness of the body or chassis, it is highly likely that the vehicle's durability and driveability will suffer. The body will flex more and eventually crack. The vehicle will not handle as well and it will be unpleasant to drive, with increased shaking of the windscreen, dashboard and steering wheel. Road shocks will be absorbed more in the flexing of the body and less in the suspension.

3 CONVERTIBLE VARIANTS OF SEDANS AND COUPES

Many convertibles produced by manufacturers may be superficially similar to their sedan or coupe variants, but may have very different body structures. It is generally impractical for a modifier to duplicate exactly the body structure of a convertible by modifying the variant.

Conversions using all manufacturers' standard components are certifiable under Code LH7.

4 CONVERTING FROM FOUR-DOOR TO TWO-DOOR

Converting a four-door vehicle to a two-door generally involves major reconstruction of the vehicle. Adequate passenger access must be provided to rear seating positions. To achieve this, vehicles must be modified to incorporate the features of vehicles originally manufactured in two-door configuration. This means that on vehicles built to comply with side intrusion and/or protection ADRs, the doors must continue to provide the same level of occupant protection.

This usually requires the front doors to be extended in length; the *B* pillars to be moved rearwards and the front seats to have tilt mechanisms incorporated. The front seat tilt mechanism must be able to be easily activated by passengers seated in the rear seats.

5 ROOF LOWERING (CHOP-TOP)

When lowering a roof structure, the minimum head space specification for front and rear seat occupants, as specified in Section LK *Seating and Occupant Protection*, must be incorporated in the design.

Driver vision must not be impaired by the modification and thus the windscreen wiper swept area must not be adversely affected. External rear vision mirrors to ADR 14/... must be fitted, if the field of view as specified in ADR 14 cannot be met by the internal mirror.

Compliance with ADRs 2, 2/..., 5x, 5/..., 8, 8/..., 11, 11/..., 14, 14/..., 29x, 29/..., 69/..., 72/..., and 73/... must be maintained where applicable.

6 REINFORCING

To produce a safe, durable vehicle, reinforcing must be compatible with the vehicle's existing structure. Strengthening should consist of material of similar thickness to that of the vehicle's original structure. The reinforcing material should not exceed twice the original thickness. The ends of reinforcing should be tapered to eliminate abrupt changes in section that produce stress concentrations, as this may promote cracking.

A convertible or cabriolet with a separate chassis, such as an early model Toyota Crown, normally requires strengthening of the body only.

A convertible or cabriolet with a separate floorpan structure, such as a Type 1 Volkswagen, normally requires strengthening of the body and floorpan structure.

A convertible and cabriolet of monocoque construction normally requires extensive strengthening, with the addition of extra structural members and gussets (refer to Figure LH4).

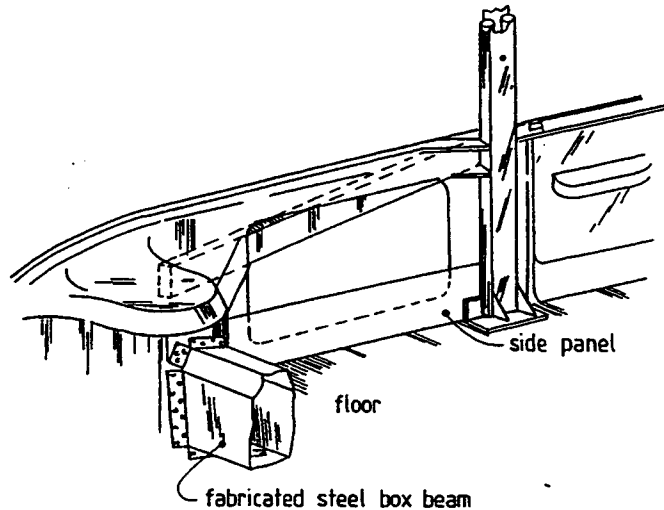


Figure LH4 Convertible Structure

The following Figure LH5 illustrates three possible methods of reinforcing sill sections, an exterior skirt (A), an internal member (B) or an interior sill section (C). The reinforcing section should be attached to the original sill along the full length of the sill.

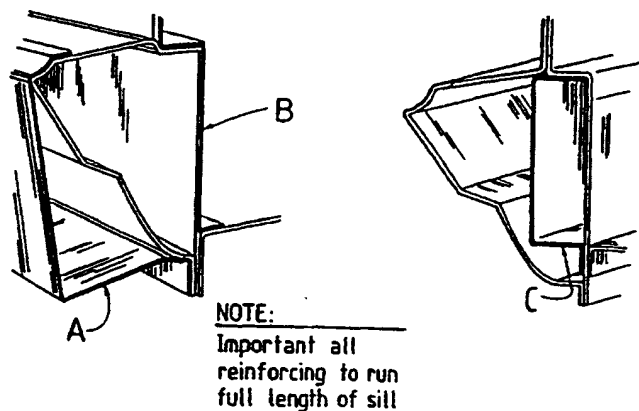


Figure LH5 Alternative Sill Details

The strength of the windscreen pillars of convertibles should be increased. Modifications may also be required to ensure the correct operation of the windows in the doors if the upper support frame is removed. The windscreen header should be reinforced and closed to form a rigid section (refer to Figure LH6). The inside of the header should be padded with 10mm minimum thickness high-density foam.

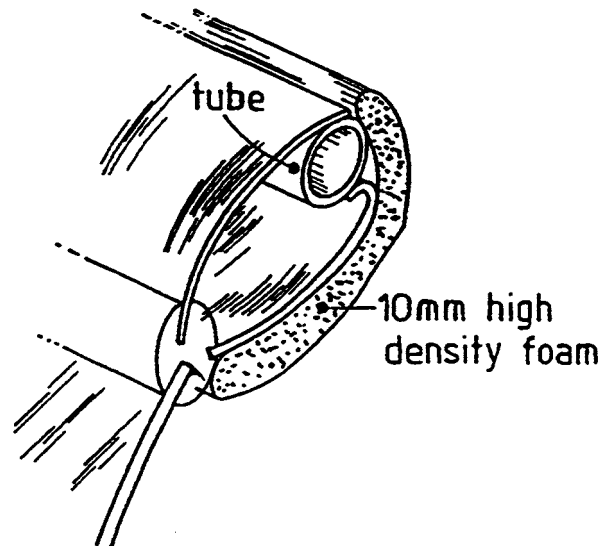


Figure LH6 Windscreen Header

The cant rails should be reinforced and closed to form a rigid section when incorporating a sun roof frame (refer Figure LH7). The sun roof frame should have large corner radii to reduce stress concentrations.

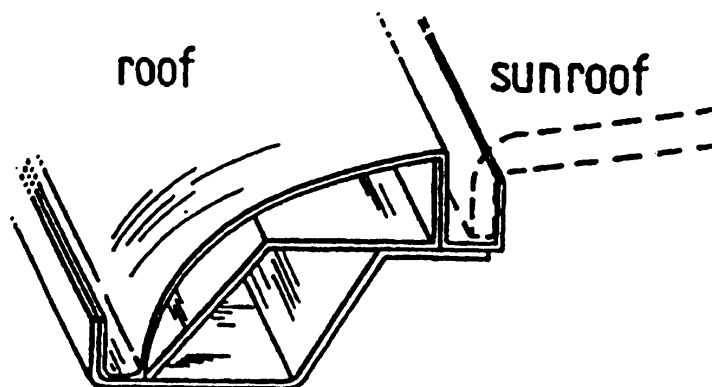


Figure LH7 Cant Rails and Sun roof Frame

Where sharp edges exist, often as a result of cutting hollow sections, such as door frames, cant rails and door pillars, they should be capped with fully welded steel covers or with *pinch weld* or equivalent (refer to Figure LH8).

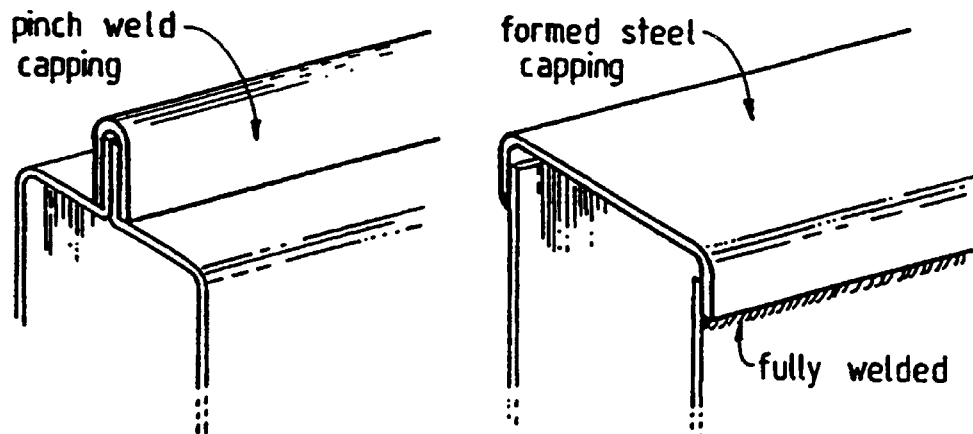


Figure LH8 Sharp Edges Capped

All unpainted inner panels and joints of steel must be treated with a rust proofing treatment, such as zinc oxide paint or a fish-oil based lacquer.

7 BEAMING AND TORSION TESTS

A vehicle converted to a convertible or cabriolet of monocoque construction must undergo beaming and torsion testing to determine its relevant stiffness, in accordance with the requirements of Code LT1 - *Beaming and Torsion Testing*.

A convertible or cabriolet with a separate floorpan or separate chassis must undergo beaming and torsion testing to determine its relevant stiffness, in accordance with the requirements of Code LT1 - *Beaming and Torsion Testing*, except if originally certified as an MC or NA Category vehicle.

A lowered roof (chop-top) vehicle or a vehicle fitted with a sun roof does not require beaming and torsion testing, except when any of the structural members such as pillars and cant rails have been removed, relocated or reduced in cross section.

8 CRASH PROTECTION

8.1 Frontal Impact

All modern vehicles are designed to comply with ADR 10 and later model vehicles with ADR 69 and ADR 73. To determine compliance, vehicles from a given model range are crash tested by the manufacturer in accordance with the test protocols applicable to the ADR under consideration. The vehicles must crumple without forcing the dashboard and steering wheel back into the driver's seating position. In addition, vehicles tested to the more recent ADRs, must not generate forces or accelerations beyond the limits specified by the ADR. These forces and accelerations are measured by anthropomorphic dummies during the test procedure.

The roof structure plays a vital role in supporting the front of the vehicle in front collisions. This is particularly so in vehicles without a chassis.

8.2 SIDE IMPACT

Removal of the roof and upper section of the vehicle's side door support panels can also have a detrimental effect on the vehicle's ability to withstand a side impact and therefore its compliance with ADR 29 or ADR 72.

8.3 SUMMARY

It is not expected that a modified vehicle or an ICV be subjected to destructive tests required by ADR 10/..., ADR 69... or ADR 73/... for frontal impact strength or ADR 29/... or ADR 72/... for side impact strength. Instead, the designer must be satisfied that the modified vehicle's structure has sufficient strength and stiffness to continue to meet the technical requirements of these ADRs where applicable. The designer must also confirm that any proposed modifications will not result in the removal of any air bag or seatbelt pre-tensioner sensors and that the modifications will not affect the proper and timely deployment of any of these safety devices.

9 SEATBELTS AND CHILD RESTRAINT ANCHORAGES

Vehicles originally manufactured to comply with ADR 4 must continue to comply.

The upper torso anchorages for the front lap/sash belt and all other anchorages must comply with the requirements of ADR 5.

Vehicles originally manufactured to comply with ADR 34 *Child Restraint Anchorages and Child Restraint Anchor Fittings* must continue to do so. The child restraint anchorages must comply with the requirements of ADR 34.

10 ROLL BAR

If a roll bar is incorporated into the design, it should comply with the requirements of Code LK8 - *Roll Bar and Roll Cage Installation*.

11 RECORDS

The signatory must hold a copy of all drawings, specifications, test results and any other data necessary to fully describe the vehicle modifications. Further details of record keeping requirements are specified by the Registration Authorities under their business rules and/or administrative procedures.

CHECKLIST LH1
ROOF CONVERSION (DESIGN)
CODE LH1

(N/A=Not Applicable, Y=Yes, N=No)

1.	STRUCTURAL REINFORCEMENT			
1.1	Is all reinforcing material thickness no more than twice the original vehicle body section thickness?		Y	N
1.2	Does the design avoid stress concentrations at the ends of reinforced sections?		Y	N
2.	BEAMING AND TORSION TESTS			
2.1	Does the body design comply with the requirements of Code LT1?	N/A	Y	N
3.	COMPLIANCE WITH ADRS			
3.1	Does the design ensure that the completed vehicle will continue to comply with the ADRs to which it was originally built?		Y	N
4.	SPECIFICATION			
4.1	Have drawings, specifications and reports for the design been submitted as required by the relevant Registration Authority?	N/A	Y	N
4.2	Has all work, that has been specified in the certification of the LH1 roof conversion, been determined in accordance with recognised engineering standards and the relevant Appendices of Section LZ <i>Appendices</i> ?		Y	N

Note: If the answer to any question is **N (No)**, the design cannot be certified under Code LH1.

[Continued Overleaf]

CERTIFICATION DETAILS															
Make						Model						Year of Manufacture			
VIN															
Chassis Number (If applicable)															
Brief Description of Modification/s															
Vehicle Modified By															
Certificate Number (If applicable)															
Vehicle Certified By (<i>Print</i>)															
Signatory's Employer (If applicable)															
Signatory's Signature												Date			

ROOF CONVERSION

CODE LH2

SCOPE

Code LH2 covers the actual roof conversion or the sun roof installation. Roof conversion designs and sun roof installation designs are covered in Code LH1.

Code LH2 does not apply to ADR category L-group vehicles and motor cycles.

MODIFICATIONS COVERED UNDER CODE LH2

The following is a summary of the modifications that are covered under Code LH2:

- Conversion of vehicles of monocoque construction to convertibles or cabriolets;
- Conversion of vehicles with separate chassis to convertibles or cabriolets;
- Conversion of vehicles to lower roof profile or roof removal (chop-top) or other re-configuration of the roof; and
- Installation of a sun roof.

MODIFICATIONS NOT COVERED UNDER CODE LH2

Modifications that are not covered under Code LH2 include:

- Construction of a completely new body on an existing chassis.

COMPLIANCE WITH APPLICABLE VEHICLE STANDARDS

Modified vehicles must continue to comply with the ADRs to which they were originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

Compliance with the AVSR also means compliance with the equivalent regulations of a State or Territory of Australia.

SPECIFIC REQUIREMENTS

The following are specific requirements for Roof Conversions under Code LH2.

The conversions must also comply with the general guidelines contained in sub-section 2 *General Requirements*.

1 DESIGN

The modification must be carried out strictly in accordance with the requirements of the design certified under Code LH1 and as outlined in the design specification and drawings.

2 WORKMANSHIP

The workmanship must be in accordance with the requirements of the design certified under Code LH1 and of sub-section 2 - *General Requirements*.

3 INSPECTION

At least one interim inspection must be carried out after all structural work is completed, but before painting and trimming of areas involved or affected by the modifications.

Previously modified vehicles that are being assessed must have all trim etc. removed to allow a thorough inspection of all modified areas.

A final inspection must be carried out on the converted vehicle when it is in a condition suitable for registration.

CHECKLIST LH2
ROOF CONVERSION
CODE LH2

(N/A= Not Applicable, Y=Yes, N=No)

1.	DESIGN			
1.1	Has the vehicle been modified in accordance with a design approved under Code LH1?	N/A	Y	N
1.2	Insert Design Approval No.....			
2.	WORKMANSHIP			
2.1	Is all work, including welding, of satisfactory quality and has all work been performed in accordance with recognised engineering standards?		Y	N
3.	FASTENERS AND WELDING			
3.1	Do all fasteners comply with the applicable requirements of Section LZ <i>Appendices - Appendix A Fasteners</i> ?	N/A	Y	N
3.2	Does the quality of welding comply with the applicable requirements of Section LZ <i>Appendices, Appendix C Heating and Welding of Steering Components</i> ?	N/A	Y	N
4.	COMPLIANCE WITH ADRS			
4.1	Does the modified vehicle continue to comply with the ADRs to which it was originally built?	N/A	Y	N
5.	BEAMING AND TORSION TESTS			
5.1	Does the body design comply with the requirements of Code LT1?		Y	N
6.	INSPECTION			
6.1	Have interim inspection(s) been carried out on all modified areas of the vehicle structure and the work found to be satisfactory?		Y	N
6.2	Has a final inspection been carried out on all modified areas of the vehicle structure and the work found to be satisfactory?		Y	N
7.	RECORDS			
7.1	Have completed records together with conversion/modification details been retained in a manner suitable for auditing?		Y	N

Note: If the answer to any question is **N (No)**, the modification cannot be certified under Code LH2.

[Continued Overleaf]

CERTIFICATION DETAILS																	
Make							Model							Year of Manufacture			
VIN																	
Chassis Number (If applicable)																	
Brief Description of Modification/s																	
Vehicle Modified By																	
Certificate Number (If applicable)																	
Vehicle Certified By (<i>Print</i>)																	
Signatory's Employer (If applicable)																	
Signatory's Signature													Date				

MODIFIED WHEELBASE CONVERSION (DESIGN)

CODE LH3

SCOPE

Code LH3 provides for the preparation of designs that may be approved by Registration Authorities for use by other signatories or modifiers. Code LH3 provides for the design of wheelbase conversions.

Code LH3 does not apply to ADR category L-group vehicles and motor cycles.

DESIGN COVERED UNDER CODE LH3

The following is a summary of the modifications that may be performed under Code LH3 - *Modified Wheelbase Conversion (Design)*.

Designs covered under this Code include:

- Extended wheelbase conversion of passenger vehicles and their derivatives;
- Design of extended wheelbase conversion of off-road passenger vehicles; and
- Design of extended wheelbase conversion of goods vehicles.

DESIGNS NOT COVERED UNDER CODE LH3

Designs that are not covered under this Code include:

- The actual physical modification of particular vehicles (this is covered by Code LH4).

COMPLIANCE WITH APPLICABLE VEHICLE STANDARDS

Modified vehicles must continue to comply with the ADRs to which they were originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

Compliance with the AVSR also means compliance with the equivalent regulations of a State or Territory of Australia.

Outlined below in Table LH4 are areas of the vehicle that may be affected by the modifications and that may require re-certification, testing and/or data to show compliance for the modified vehicle. This is not an exhaustive list and other modifications may also affect ADR compliance.

Table LH4 Summary of items that if modified, may detrimentally affect compliance with applicable ADRs

DETAIL	REQUIREMENTS
Installation of Seats and Seat Anchorages	ADR 3x, 3/... VSB 5A, VSB 5B
Installation of Seatbelts and Seatbelt Anchorages	ADR 4x, 4/... ADR 5x, 5/... VSB 5A, VSB 5B
Child Restraint Anchorages	ADR 5/... ADR 34x, 34/... VSB 5A, VSB 5B
Additional Windows	ADR 8, 8/...
Rear Vision Mirrors	ADR 14, 14/...
Head Restraints	ADR 22x, 22/...
Side Impact Protection	ADR 29, 29/..., 72/...
Braking System	ADR 31, 31/...
Tyre Performance and Capacity	ADRs 23x, 23/... and 42/04 (These ADRs still apply). (The AVSR still demands maintenance of original manufacturer's load rating).

To determine the ADRs that apply to the vehicle in question, refer to the applicability table in Section LO. Vehicles manufactured after 1 January 1969 and prior to 1 July 1988 need to comply with the Second Edition ADRs whilst vehicles manufactured after this date need to comply with the Third Edition ADRs. Section LO has separate applicability tables for each edition.

Alternatively, ADR applicability tables for individual vehicle categories may be referenced on the Department of Infrastructure and Transport *RVCS* website at the following address and under the section titled *ADR Applicability Tables*:

<http://rvcs.dotars.gov.au/>

The ADRs apply according to the vehicle's category and date of manufacture. It is the responsibility of the signatory to refer to the appropriate ADR applicable to the vehicle.

If any of the areas listed above have been affected by the modifications, they must comply with the prescribed standards.

SPECIFIC REQUIREMENTS

The following are items that need to be considered in the preparation of designs for modified wheelbase conversions that are to be certified under Code LH3.

The conversions must also comply with the general guidelines contained in sub-section 2 *General Requirements*.

1 STRENGTH AND SAFETY

Modification of a passenger vehicle by extending its wheelbase without additional reinforcing can significantly reduce the strength and the safety of the vehicle.

2 BODY FLEXING

If a vehicle is modified in a way that drastically reduces its stiffness, its durability and driveability are reduced. With reduced stiffness, the body will flex and eventually crack. The increased flexibility will adversely affect the vehicle's handling and make it unpleasant to drive.

3 REINFORCING

To produce a safe, durable vehicle, reinforcing must be compatible with the vehicle's existing structure. Strengthening should consist of material of similar thickness to that of the vehicle's original structure. The reinforcing material should not exceed twice the original thickness. The ends of reinforcing should be tapered to eliminate abrupt changes in section that produce stress concentrations, as this may promote cracking.

An extended wheelbase passenger vehicle of monocoque construction usually requires strengthening, with the addition of extra structural members in the sill and cant rail areas.

An extended wheelbase passenger vehicle with a separate chassis usually requires sill and cant rail reinforcing together with chassis reinforcing.

An extended wheelbase vehicle with a separate chassis originally certified as an ADR NA Category vehicle, usually only requires chassis reinforcing.

3.1 Sill Reinforcement

The following Figure LH9 illustrates three possible methods of reinforcing sill sections, an exterior skirt (A), an internal member (B) or an interior sill section (C). The additional strengthening section should be attached to the original sill along the full length of the sill.

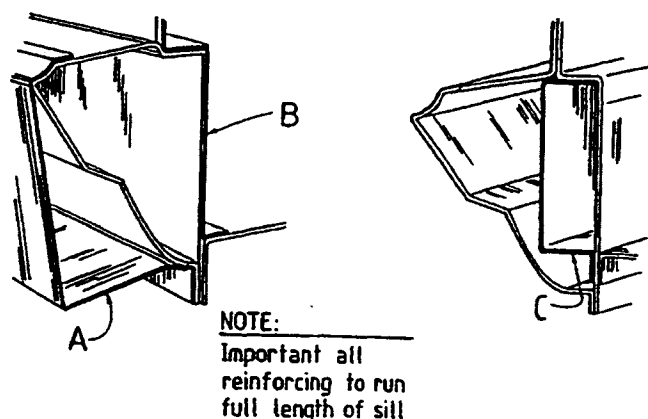


Figure LH9 Sill Reinforcement Details

3.2 Cant Rail Reinforcement

The following Figure LH10 illustrates two possible methods of reinforcing cant rail sections, an internal pressed steel section (D) or a rectangular hollow section (E). The additional section should be attached to the original cant rail along its length.

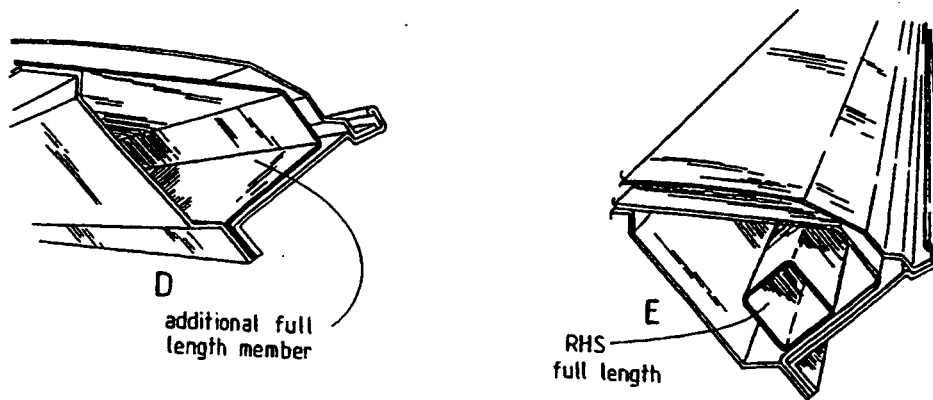


Figure LH10 Cant Rail Reinforcement Details

3.3 Floor Channel Section Reinforcement

The following illustrates a method of reinforcing the joints of the floorpan main channel sections. In this case, a pressed *top hat* steel section overlaps the original floorpan channel by at least twice its width and is plug welded (refer to Figure LH11). The new channel section should be attached to the floorpan at regular intervals along its length. Its thickness should be no greater than twice the original floor channel's material thickness.

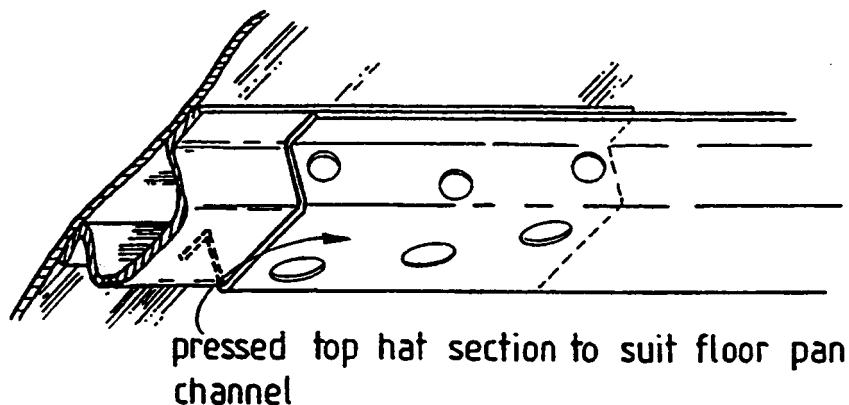


Figure LH11 Floor Channel Section Reinforcement

All unpainted inner panels and joints of steel must be treated with a rust proofing treatment, such as zinc oxide paint or a fish-oil based lacquer.

4 BEAMING AND TORSION TESTS

4.1 Testing

Extended wheelbase passenger vehicles of monocoque construction must undergo beaming and torsion testing to determine their relevant stiffness, in accordance with the requirements of Code LT1 - *Beaming and Torsion Testing*.

Extended wheelbase passenger vehicles with separate chassis (e.g. Cadillac, Lincoln) and goods vehicles with separate chassis (e.g. Hilux, Holden one-tonne utility) do not need to undergo beaming and torsion testing to determine their relevant stiffness. In the absence of testing, these vehicles must be shown to be within the limits for beaming deflection by calculation. The modified vehicle's beaming deflection must be no greater than the beaming deflection of the original vehicle, multiplied by the ratio of the modified wheelbase to the original wheelbase. This can be calculated as outlined below in sub-sections 4.2 and 4.3.

4.2 Loads (Vehicles With a Separate Chassis)

A uniformly distributed load should be determined for the unmodified vehicle (without passengers) between the centre lines of the front and rear axles. Point loads of 68 kg per seating position are then to be added.

A uniformly distributed load should then be determined for the modified vehicle in the same manner ensuring that all extra equipment is now fitted (e.g. seats, TVs, driver partitions etc.) are included. Point loads of 68 kg per seating position are then to be added.

Bending moment diagrams are then to be produced using the loads and their relative positions, as determined above, for the unmodified and modified vehicles.

4.3 Calculation (Vehicles With a Separate Chassis)

The vehicle, viewed side on, may be treated as a set of separate beams simply supported at the centre lines of the front and rear axles. The vehicle body forward of the front axle centre line and rearward of the rear axle centre line may be ignored for the purposes of these calculations.

The moment of inertia, of the unmodified and modified vehicles, may be calculated by assuming that only the cant rails, sills and chassis provide the structural support of the vehicle, that they are separate members in bending and that the sum of their separate moments of inertia constitutes the bending stiffness of the vehicle. If the original and modified vehicle's moment of inertia are both calculated in this manner, a direct comparison can be made without having to determine the absolute values.

With the bending moment diagrams and the moment of inertias of the cant rails, sills and chassis determined, the deflection of the unmodified and modified vehicles can be compared.

The modified vehicle must have a deflection no greater than the original vehicle's deflection multiplied by the percentage increase in wheelbase.

5 DRIVE SHAFTS

To ensure reliability and safety, all drive shaft flanges must be mated correctly and all driveline components must be correctly balanced. The services of a driveline specialist should be utilised to ensure compliance with these requirements. Where drive shafts are extended they must be manufactured in accordance with a recognised industry code of practice, which covers

recommended shaft lengths and diameters. Drive shaft universal joints must not be installed at an angle in excess of the universal joint manufacturer's recommendations.

6 CRASH PROTECTION

Vehicles originally manufactured to comply with ADR 29 – *Side Door Strength*, must continue to do so. The vehicle's ability to withstand a side impact must not be reduced. Anti-intrusion rails (refer to Figure LH12) must be fitted along the full length of the cabin. The rails must be designed to meet the strength requirements of ADR 29.

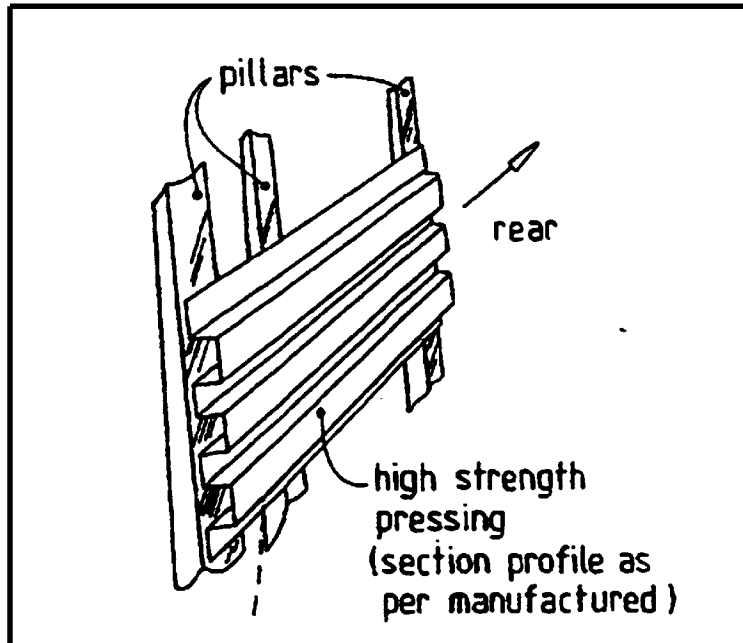


Figure LH12 Anti-Intrusion Rail

7 REARWARD-FACING SEAT SUPPORT FRAME

7.1 Structural

The seat support frame (refer to Figure LH13) must be able to withstand the same occupant forces generated by seatbelts on a forward facing seat in a frontal impact. The rearward facing seat support structure must therefore be capable of withstanding a 20 g deceleration with an adult in each seating position.

The rearward-facing seat must be capable of simultaneously withstanding the loads shown below at a deceleration of 20 g:

- The mass of the seat and any supplementary structure; and
- A mass of 68 kg located at each seating position

The direction and line of application of these forces is detailed in ADR 3.

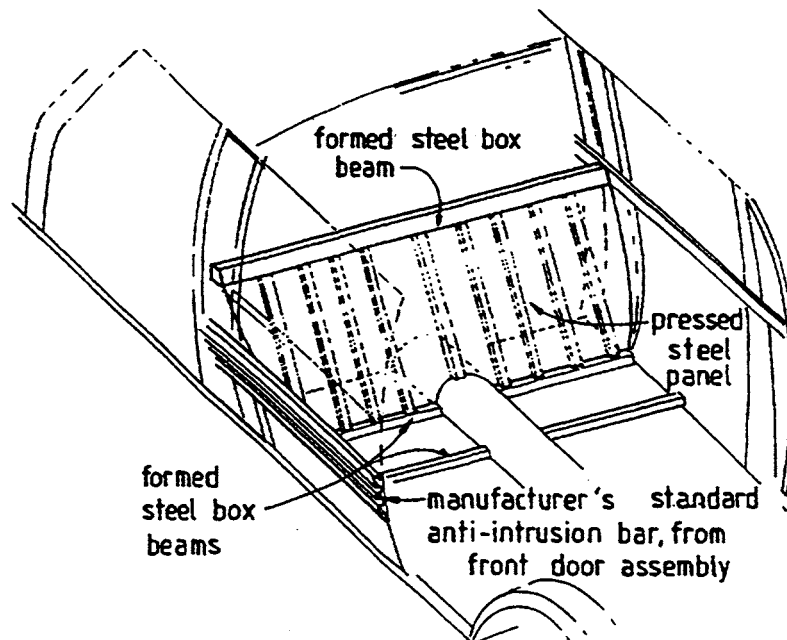


Figure LH13 Rearward Facing Seat Support Frame

7.2 Head Restraints (Rearward Facing Seats)

Head restraints complying with the requirements of ADR 22 must be fitted at all rearward facing seating positions. The recommended height of the head restraint, measured from the uncompressed seat cushion to the uppermost point of the head restraint, is 750mm. Depending upon the compressibility of the seat cushion, a height of less than 750mm may be acceptable provided that the minimum distance from the Seating Reference Point to the top of the head restraint is not less than 700mm.

The head restraint must be capable of withstanding a load of 5.75 kg at 20 g (1.13 kN) located 675mm above the Seating Reference Point along the Torso Line. The deflection of the fully laden rearward facing head restraint must not exceed 100mm in the forward direction.

8 HEAD RESTRAINTS (ALL SEATS)

If the vehicle is fitted with a glass partition between the first and second row of seats, a head restraint complying with ADR 22 must be fitted to the front central seating position (refer to Section LK *Seating and Occupant Protection*).

9 SEATBELTS AND CHILD RESTRAINT ANCHORAGES

Vehicles originally manufactured to comply with ADR 34 *Child Restraint Anchorages and Child Restraint Anchor Fittings* must continue to do so and the anchorages must comply with the requirements of ADR 34 (refer to Section LK *Seating and Occupant Protection*).

10 RECORDS

The signatory must hold a copy of all drawings, specifications, test results and any other data necessary to fully describe the vehicle modifications. Further details of record keeping requirements are specified by the Registration Authorities under their business rules and/or administrative procedures.

CHECKLIST LH3

MODIFIED WHEELBASE CONVERSION (DESIGN)

CODE LH3

(N/A= Not Applicable, Y=Yes, N=No)

1.	STRUCTURAL REINFORCEMENT			
1.1	Is the reinforcing material thickness specified no more than twice original section thickness?		Y	N
1.2	Does the design minimise stress concentrations at the ends of reinforcing sections?		Y	N
1.3	Do floor channel rail sections and joints meet specification requirements?		Y	N
2.	BEAMING AND TORSION TESTS			
2.1	Does the design of the modified monocoque body comply with Code LT1 requirements?	N/A	Y	N
2.2	For vehicles with a full chassis, note the calculated beaming value before the vehicle is modified. Nm			
2.3	For vehicles with a full chassis, is the modified vehicle's beaming deflection less than the beaming deflection of the original vehicle, multiplied by the ratio of the modified wheelbase to the original wheelbase?	N/A	Y	N
3.	COMPLIANCE WITH ADRS			
3.1	Does the design ensure that the modified vehicle will continue to comply with the ADRs to which it was originally built?		Y	N
4.	SPECIFICATION			
4.1	Have drawings, specifications and reports concerning the design been produced and submitted as required by the relevant Registration Authority.?	N/A	Y	N
4.2	Has all work, that has been specified in the certification of the LH3 wheelbase conversion design, been determined in accordance with recognised engineering standards and the relevant Appendices of Section LZ <i>Appendices</i> ?		Y	N

Note: If the answer to any question is **N (No)**, the design is not acceptable under Code LH3.

[Continued Overleaf]

CERTIFICATION DETAILS															
Make						Model					Year of Manufacture				
VIN															
Chassis Number (If applicable)															
Brief Description of Modification/s															
Vehicle Modified By															
Certificate Number (If applicable)															
Vehicle Certified By (<i>Print</i>)															
Signatory's Employer (If applicable)															
Signatory's Signature										Date					

MODIFIED WHEELBASE CONVERSION

CODE LH4

SCOPE

Code LH4 covers the actual wheelbase conversion for conversions that have an LH3 Code wheelbase conversion design. Wheelbase conversion designs are covered in Code LH3.

Code LH4 does not apply to ADR category L-group vehicles and motor cycles.

MODIFICATIONS COVERED UNDER CODE LH4

The following is a summary of the modifications that may be performed under Code LH4:

- Extended wheelbase conversions of passenger vehicles and their derivatives;
- Extended wheelbase conversions of off-road passenger vehicles; and
- Extended wheelbase conversions of goods vehicles.

MODIFICATIONS NOT COVERED UNDER CODE LH4

Modifications that are not covered under Code LH4 include:

- Conversions that do not have a design in accordance with the requirements of Code LH3.

COMPLIANCE WITH APPLICABLE VEHICLE STANDARDS

Modified vehicles must continue to comply with the ADRs to which they were originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

Compliance with the AVSR also means compliance with the equivalent regulations of a State or Territory of Australia.

SPECIFIC REQUIREMENTS

The following are specific requirements for Extended Wheelbase Passenger Vehicle Conversions to be certified-under Code LH4.

The conversions must also comply with the general guidelines contained in sub-section 2 *General Requirements*.

1 DESIGN

The modification must be carried out in accordance with the requirements of the design certified under Code LH3 and as outlined in the design specifications and drawings.

2 WORKMANSHIP

The workmanship must be in accordance with the requirements of the design certified under Code LH3 and of sub-section 2 - *General Requirements*.

3 INSPECTION

The Signatory must conduct at least two inspections of the vehicle. The first, an interim inspection is to be arranged for the structurally completed vehicle. The inspection is to be carried out prior to painting and trimming of the modified areas. This may be carried out in several stages, depending on how the vehicle is modified. A final inspection is to be carried out on the completed vehicle when it is in a condition suitable for registration.

Previously modified vehicles that are being assessed must have all trim etc. removed to allow a thorough inspection of all modified areas.

4 RECORDS

The signatory must hold a copy of all drawings, specifications, test results and any other data necessary to fully describe the vehicle modifications. Further details of record keeping requirements are specified by the Registration Authorities under their business rules and/or administrative procedures.

CHECKLIST LH4

MODIFIED WHEELBASE CONVERSION CODE LH4

(N/A=Not Applicable, Y=Yes, N=No)

1.	DESIGN			
1.1	Has the vehicle been modified in accordance with the design approved under Code LH3?		Y	N
1.2	Insert Design Approval No.....			
1.3	Original Wheelbase _____mm		Final Wheelbase _____mm	
2.	WORKMANSHIP			
2.1	Is all work, including welding, of satisfactory quality and has all work been performed in accordance with recognised engineering standards?		Y	N
3.	FASTENERS AND WELDING			
3.1	Do all fasteners comply with the applicable requirements of Section LZ <i>Appendices - Appendix A Fasteners</i> ?	N/A	Y	N
3.2	Does the quality of welding comply with the applicable requirements of Section LZ <i>Appendices, Appendix C Heating and Welding of Steering Components</i> ?	N/A	Y	N
4.	COMPLIANCE WITH ADRS			
4.1	Does the modified vehicle continue to comply with the ADRs to which it was originally built?	N/A	Y	N
5.	INSPECTION			
5.1	Have interim inspection(s) been carried out on all modified areas of the vehicle structure and the work been found to be satisfactory?		Y	N
5.2	Has a final inspection been carried out on all modified areas of the vehicle structure and the work found to be satisfactory?		Y	N

[Continued overleaf]

6.	BEAMING AND TORSION TESTS			
6.1	Does the body design comply with the requirements of Code LT1?		Y	N
6.2	Note the average torsional rigidity value calculated at the completion of testing. Nm per degree			
6.3	Note the average beaming value calculated at the completion of testing. Nm			

Note: If the answer to any question is **N (No)**, the modification cannot be certified under Code LH4.

CERTIFICATION DETAILS															
Make						Model						Year of Manufacture			
VIN															
Chassis Number (If applicable)															
Brief Description of Modification/s															
Vehicle Modified By															
Certificate Number (If applicable)															
Vehicle Certified By (<i>Print</i>)															
Signatory's Employer (If applicable)															
Signatory's Signature												Date			

VEHICLE CONSTRUCTION (DESIGN)

CODE LH5

SCOPE

Code LH5 provides for vehicle construction designs based on vehicle definitions and *date of manufacture* contained in the **Introduction - Vehicle Definitions**.

Code LH5 does not apply to ADR category L-group vehicles, motor cycles, the construction of ICVs and Street Rods.

DESIGNS COVERED UNDER CODE LH5

The following is a summary of the designs that may be certified under Code LH5, based on the vehicle definitions and *date of manufacture* contained in the **Introduction - Vehicle Definitions**.

Designs covered under this Code for vehicles classified as *Modified Production Vehicles* include the following:

- Conversion of the body or cabin of a vehicle with separate chassis frame to a non-standard variation of the body or cabin;
- Structural modifications to extend inner mudguards;
- Modifying an existing or fitting an alternative transmission tunnel;
- Fitting of a tilt-front to a post-1970 production vehicle; and
- Fitting of fibreglass replacement panels to a post-1970 production vehicle.

The following modifications covered under Code LH5 are classified as *Extensive Modifications to Production Vehicles*:

- Construction of a vehicle from an unmodified production vehicle chassis assembly, (including engine, transmission, brakes and suspension) and either:
 - an unmodified body from another vehicle model;
 - a modified body from another vehicle model; or
 - a newly constructed body.
- Construction of a vehicle from a modified production vehicle chassis and either:
 - an unmodified body from another vehicle model;
 - a modified body from another vehicle model; or
 - a newly constructed body.
- Construction of a vehicle from a newly constructed chassis and either:
 - an unmodified body from another vehicle model; and
 - a modified body from another vehicle model.

DESIGNS NOT COVERED UNDER CODE LH5

Designs that are not covered under this code include:

- Design of a convertible or cabriolet conversion (this is covered by Code LH1);
- Design of an extended wheelbase conversion (this is covered by Code LH3);
- Conversion of a vehicle to one of its model variants (this is covered by Code LH7);
- Construction of a *Street Rod* (this is covered by Code LO6);
- The actual construction of vehicles (this is covered by Code LH6); and
- The design of an ICV chassis or body (this is covered in Section LO).

COMPLIANCE WITH APPLICABLE VEHICLE STANDARDS

Modified vehicles must continue to comply with the ADRs to which they were originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

Compliance with the AVSR also means compliance with the equivalent regulations of a State or Territory of Australia.

ADR Applicability: (Body and Chassis)

For the purposes of assessing compliance with ADRs, re-bodied and re-chassied vehicles are deemed to consist of two major components, these being the *chassis* and the *body*, which are considered separately.

Chassis (Including Engine, Suspension and Braking System)

The *chassis* for the purposes of ADR compliance is taken to include all components that may affect the vehicle's compliance with chassis or running gear related ADRs. These include engine, brakes, wheels and tyres, suspension and steering.

If the new vehicle uses an unmodified chassis, suspension and braking system from a production motor vehicle, and if the vehicle is similar in mass and mass distribution to that of the donor vehicle, the chassis is considered to be unmodified. No additional ADR certification is required.

If the chassis is a modified production chassis (shortened or lengthened beyond that of any manufacturer's variants), if the suspension or brakes are modified, or if the new vehicle is substantially heavier or different in mass distribution from that of the chassis donor vehicle, the vehicle's braking system will require re-certification.

Body

The *body* for the purposes of ADR compliance includes all other parts of the vehicle where the ADRs apply. Components and structures that form the *body* include:

- occupant protection measures such as crumple zones;
- occupant restraints including seatbelts, child restraint anchorages and airbags;

- lighting and glazing;
- windscreen wipers, washers and demisters;
- body structure, panels, and doors;
- steering columns; and
- controls and instrumentation.

Note: Where modifications to the transmission or transmission tunnel are required, owners must reference Section LB *Transmission* to determine whether it is necessary to certify the intended modifications under Section LB also.

SPECIFIC REQUIREMENTS

The following are specific requirements for the design of vehicles to be constructed and certified under Code LH5.

The conversions must also comply with the general guidelines contained in sub-section 2 *General Requirements*.

1 STRENGTH AND STIFFNESS

The vehicle's structure must have adequate strength and stiffness to provide protection for the occupants and to ensure safe handling. If a vehicle is constructed with low stiffness, its durability and driveability are reduced, and the body will flex and eventually crack. The flexing will make it unpleasant to drive.

1.1 Beaming and Torsion Tests

Torsion rigidity tests must be performed as specified in Section LT Code LT1 - *Beaming and Torsion Testing*. A torsion rigidity of at least 4,000 Nm per degree is required for most passenger vehicles.

2 STEERING AND SUSPENSION

Steering and suspension systems must be designed to ensure adequate strength and to ensure safe vehicle handling (refer to Section LS *Tyres, Rims, Suspension and Steering* for more information about steering and suspension modifications).

Steering and suspension systems can comprise components from standard production vehicles with an identical physical layout. However, systems may also be made from a combination of suspension and steering components from various vehicles. The components must be selected to ensure that they have adequate strength for the loads imposed and will not be at risk of fatigue failure.

2.1 Welding of Steering and Suspension Components and Metallurgical Testing

For mandatory requirements and guidance on welding techniques and procedures refer to Appendix C in Section LZ *Appendices*.

2.2 Handling Test

All vehicles with non-standard steering and suspension or vehicles with standard steering and suspension that are fitted with wheel rims that increase the original track by more than 50mm,

must successfully complete a Lane-Change Manoeuvre Test in accordance with the test procedure in Section LT *Test Procedures*, Code LT2.

CHECKLIST LH5
VEHICLE CONSTRUCTION (DESIGN)

CODE LH5

(N/A=Not Applicable, Y=Yes, N=No)

1.	STRUCTURAL DESIGN			
1.1	Is all reinforcing material thickness designed to be no more than twice original section thickness?		Y	N
1.2	Does the design avoid stress concentrations at the ends of reinforcing sections?		Y	N
1.3	If fibreglass has been used has it been tested and found to comply with the Standards specified in sub-section 2.7 of <i>General Requirements</i> ?		Y	N
2.	BEAMING AND TORSION TESTS			
2.1	Does the vehicle design comply with Code LT1 requirements?	N/A	Y	N
3.	STEERING AND SUSPENSION			
3.1	Do steering and suspension components have adequate strength as designed?	N/A	Y	N
3.2	Have weld procedures and non-destructive testing (X-ray, ultrasonic, dye penetrant) been specified for modified welded components?	N/A	Y	N
3.3	Has bump-steer been checked and does it comply with requirements?	N/A	Y	N
3.4	Does the vehicle design comply with requirements of Code LT2, <i>Lane-Change Manoeuvre Test</i> and is a report attached?	N/A	Y	N
4.	COMPLIANCE WITH ADRS			
4.1	Does the modified vehicle continue to comply with the ADRs to which it was originally built?		Y	N

[Continued overleaf]

5.	SPECIFICATION			
5.1	Have drawings, specifications and reports of the design been produced?	N/A	Y	N
5.2	Has all work, that has been specified in the certification of the LH5 design, been determined in accordance with recognised engineering standards and the relevant Appendices of Section LZ <i>Appendices</i> ?		Y	N

Note: If the answer to any question is **N (No)**, the design is not acceptable under Code LH5.

CERTIFICATION DETAILS																
Make						Model						Year of Manufacture				
VIN																
Chassis Number (If applicable)																
Brief Description of Modification/s																
Vehicle Modified By																
Certificate Number (If applicable)																
Vehicle Certified By (<i>Print</i>)																
Signatory's Employer (If applicable)																
Signatory's Signature											Date					

VEHICLE CONSTRUCTION

CODE LH6

SCOPE

This code provides for the actual construction of vehicles and the actual modification of vehicles that have a Code LH5 design.

Code LH6 does not apply to ADR category L-group vehicles, motor cycles, the construction of ICVs and Street Rods.

CONSTRUCTION AND MODIFICATIONS COVERED UNDER CODE LH6

Construction and modifications that may be performed under this Code include:

- Vehicle construction based on a design under Code LH5; and
- Vehicle body modification based on a design under Code LH5.

CONSTRUCTION AND MODIFICATIONS NOT COVERED UNDER CODE LH6

Construction and modifications that are not covered under this Code include:

- Construction of a *Street Rod* (this is covered by Code LO6).

COMPLIANCE WITH APPLICABLE VEHICLE STANDARDS

The modified vehicle must continue to comply with all applicable ADRs, AVSRs, Vehicle Standards Bulletins, Acts and Regulations.

SPECIFIC REQUIREMENTS

This sub-section applies to all light vehicles and must be read and applied in conjunction with all the LH Codes applicable to the proposed modifications.

Modified vehicles must continue to comply with the ADRs to which they were originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

Compliance with the AVSR also means compliance with the equivalent regulations of a State or Territory of Australia.

1 DESIGN

The construction and modifications must be carried out in accordance with the requirements of the design certified under Code LH5 and as outlined in the design specification and drawings.

2 WORKMANSHIP

The workmanship must be in accordance with the requirements of the design certified under Code LH5 and of sub-section 2 - *General Requirements*.

3 INSPECTION

An inspection must be carried out on the structurally completed vehicle prior to painting and trimming of all modified areas.

Previously modified vehicles that are being assessed must have all trim etc. removed to allow a thorough inspection of all modified areas.

A final inspection is to be carried out on the completed vehicle when it is in a condition suitable for registration.

4 RECORDS

The signatory must hold a copy of all drawings, specifications, test results and any other data necessary to fully describe the vehicle modifications. Further details of record keeping requirements are specified by the Registration Authorities under their business rules and/or administrative procedures.

CHECKLIST LH6

VEHICLE CONSTRUCTION - CODE LH6

(N/A=Not Applicable, Y=Yes, N=No)

1.	DESIGN			
1.1	Has the vehicle been modified in accordance with the design approved under Code LH5?	N/A	Y	N
1.2	Insert Design Approval No.....			
2.	WORKMANSHIP			
2.1	Is all work, including welding, of satisfactory quality and has all work been performed in accordance with recognised engineering standards?		Y	N
3.	WELDING			
3.1	Does the quality of welding comply with the applicable requirements of Section LZ <i>Appendices</i> , Appendix C <i>Heating and Welding of Steering Components</i> ?	N/A	Y	N
4.	FASTENERS			
4.1	Do all fasteners comply with the applicable requirements of Section LZ <i>Appendices</i> - Appendix A <i>Fasteners</i> ?	N/A	Y	N
5.	COMPLIANCE WITH ADRS			
5.1	Does the modified vehicle continue to comply with the ADRs to which it was originally built?	N/A	Y	N
6.	INSPECTION			
6.1	Have interim inspection(s) been carried out on all modified areas of the vehicle structure and the work found to be satisfactory?		Y	N
6.2	Has a final inspection been carried out on the complete vehicle and the work found to be satisfactory?		Y	N
7.	TESTING			
7.1	Does the vehicle design comply with requirements of Code LT2, <i>Lane-Change Manoeuvre Test</i> and is a report attached?	N/A	Y	N

Note: If the answer to any question is **N (No)**, the construction or modification cannot be certified under Code LH6.

[Continued overleaf]

CERTIFICATION DETAILS															
Make						Model					Year of Manufacture				
VIN															
Chassis Number (If applicable)															
Brief Description of Modification/s															
Vehicle Modified By															
Certificate Number (If applicable)															
Vehicle Certified By (<i>Print</i>)															
Signatory's Employer (If applicable)															
Signatory's Signature										Date					

BODY/CHASSIS VARIANTS CONVERSION

CODE LH7

SCOPE

This code provides for the conversion of a vehicle to one of its manufacturer's model variants.

Code LH7 does not apply to ADR category L-group vehicles and motor cycles.

CONVERSIONS COVERED UNDER CODE LH7

A manufacturer's model variant is a vehicle that varies from the base vehicle model with different features such as additional seating, access and/or load space. Variants often share the same front body structure, but have different rear body configurations, e.g. sedans, coupes, convertibles, hatchbacks, utilities and station wagons.

For example, under this Code, certain panel vans may be converted to their corresponding utility variant using new utility body panels supplied by the manufacturer, or they can be converted by replacing their rear body or chassis section with that from the utility variant.

Conversions that are covered under this Code include:

- Conversion of any light vehicle to a manufacturer's variant of that model;
- Conversion of a panel van or station wagon to a manufacturer's utility variant;
- Conversion of a sedan to a manufacturer's station wagon variant;
- Conversion of a coupe to a manufacturer's hatchback or convertible variant;
- Conversion of a vehicle to a manufacturer's four wheel drive variant; and
- Conversion of a single cab utility to a manufacturer's extended or dual cab utility variant.

CONVERSIONS NOT COVERED UNDER CODE LH7

Conversions that are not covered under this Code include:

- Conversion of a vehicle to a variant that is different in construction from the manufacturer's variant;
- Conversion of a sedan or coupe to a convertible or cabriolet using non-standard components and reinforcement sections (this is covered by Codes LH1 and LH2); and
- Conversion of a single cab utility to a non-standard extended or dual cab utility (this is covered by Codes LH5 and LH6).

COMPLIANCE WITH APPLICABLE VEHICLE STANDARDS

Modified vehicles must continue to comply with the ADRs to which they were originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

Compliance with the AVSR also means compliance with the equivalent regulations of a State or Territory of Australia.

Outlined below in Table LH5 are areas of the vehicle that may be affected by the modifications and that may require re-certification, testing and/or data to show compliance for the modified vehicle. This is not an exhaustive list and other modifications may also affect ADR compliance.

Table LH5 Summary of items that if modified, may detrimentally affect compliance with applicable ADRs

DETAIL	REQUIREMENTS
Installation of Seats and Seat Anchorages	ADR 3x, 3/... VSB 5A, VSB 5B.
Installation of Seatbelts and Seatbelt Anchorages	ADR 4x, 4/... ADR 5x, 5/... VSB 5A, VSB 5B.
Replacement Windows	ADR 8, 8/....

To determine the ADRs that apply to the vehicle in question, refer to the applicability table in Section LO. Vehicles manufactured on or after 1 January 1969 and prior to 1 July 1988 need to comply with the Second Edition ADRs whilst vehicles manufactured after this date need to comply with the Third Edition ADRs. Section LO has separate applicability tables for each edition.

Alternatively, ADR applicability tables for individual vehicle categories may be referenced on the Department of Infrastructure and Transport *RVCS* website at the following address and under the section titled *ADR Applicability Tables*:

<http://rvcs.dotars.gov.au/>

The ADRs apply according to the vehicle's category and date of manufacture. It is the responsibility of the signatory to refer to the appropriate ADR applicable to the vehicle.

SPECIFIC REQUIREMENTS

The following are specific requirements for Body/Chassis Variant Conversions to be certified under Code LH7.

The conversions must also comply with the general guidelines contained in sub-section 2 *General Requirements*.

1 BODY COMPONENTS

Standard body components or equivalent for the variant model must be used for all replacement panels.

Equivalent panels and brackets may be used, provided that the replacement panels are at least equivalent material in thickness and strength.

Where sharp edges exist, they should be capped with fully welded steel covers or pinch weld or equivalent (see Figure LH7, Code LH1).

1.1 Mechanical Components

If any of the standard mechanical components, including engine, transmission, suspension and braking system for the variant model are not used, it will be necessary to certify these modifications separately under the appropriate Sections of VSB 14.

1.2 General

Replacement panels must be attached with at least the same number and size of welds as on the standard variant.

Where panels are intermittently welded, they must be fully sealed to prevent the ingress of exhaust gases into the cabin.

Glazing must comply with the requirements of ADR 8 - *Safety Glazing Material* and must have the appropriate Standards marking (refer to Appendix G in Section LZ *Appendices* for more information).

The structural integrity of existing seatbelt mountings must be maintained by ensuring that all original mounting and reinforcing sections are retained or replaced.

2 INSPECTION

An inspection must be carried out on the structurally completed vehicle prior to painting and trimming of all modified areas.

Previously modified vehicles that are being assessed must have all trim etc. removed to allow a thorough inspection of all modified areas.

A final inspection is to be carried out on the converted vehicle when it is in a condition ready for registration.

3 RECORDS

The signatory must hold a copy of all drawings, specifications, test results and any other data necessary to fully describe the vehicle modifications. Further details of record keeping requirements are specified by the Registration Authorities under their business rules and/or administrative procedures.

CHECKLIST LH7
BODY/CHASSIS VARIANTS CONVERSION
CODE LH7

(N/A=Not Applicable, Y=Yes, N=No)

1.	DESIGN			
1.1	Has the vehicle been modified exactly in accordance with the design of the manufacturer's standard variant, using standard or equivalent components?		Y	N
1.2	Are all replacement panels and reinforcing equivalent in thickness and strength to those of the standard variant?		Y	N
1.3	Are replacement panels attached equivalent to that of the original?		Y	N
1.4	If fibreglass has been used has it been tested and found to comply with the Standards specified in Section 2.7 of <i>General Requirements</i> ?		Y	N
1.5	Insert Design Approval No.....			
2.	FASTENERS AND WELDING			
2.1	Do all fasteners comply with the applicable requirements of Section LZ <i>Appendices - Appendix A Fasteners</i> ?		Y	N
2.2	Does the quality of welding comply with the applicable requirements of Section LZ <i>Appendices, Appendix C Heating and Welding of Steering Components</i> ?		Y	N
3.	WORKMANSHIP			
3.1	Is all work, including welding, of satisfactory quality and has all work been performed in accordance with recognised engineering standards?		Y	N
3.2	Are replacement panels fully sealed to prevent ingress of exhaust gases?		Y	N
3.3	Are all sharp edges capped or covered?		Y	N

[Continued overleaf]

(N/A=Not Applicable, Y=Yes, N=No)

4.	COMPLIANCE WITH ADRS			
4.1	Do all seats and seat anchorages comply with the relevant ADRs?		Y	N
4.2	Do all seatbelts and seatbelt anchorages comply with the relevant ADRs?		Y	N
4.3	Does all replacement glass comply with the relevant ADR?		Y	N
5.	INSPECTION			
5.1	Were interim inspection(s) carried out on all modified areas of the vehicle structure and the work found to be satisfactory?	N/A	Y	N
5.2	Was a final inspection carried out on all modified areas of the vehicle structure and the work found to be satisfactory?	N/A	Y	N
6.	RECORDS			
6.1	Have complete records of vehicle details and conversion/construction been retained in a manner suitable for auditing?		Y	N

Note: If the answer to any question is **N (No)**, the modification cannot be certified under Code LH7.

CERTIFICATION DETAILS																
Make							Model							Year of Manufacture		
VIN																
Chassis Number (If applicable)																
Brief Description of Modification/s																
Vehicle Modified By																
Certificate Number (If applicable)																
Vehicle Certified By (<i>Print</i>)																
Signatory's Employer (If applicable)																
Signatory's Signature												Date				

CAMPERVAN, MOTORHOME CONVERSION

CODE LH11

SCOPE

This Code provides information on the minimum safety requirements for a vehicle being converted to a campervan/motorhome.

Code LH11 does not apply to ADR category L-group vehicles and motor cycles.

The requirements apply to those vehicles that have been previously registered and used in transport in Australia.

Note: Where any modification is intended to be carried out on a vehicle not previously registered and used in transport, such a vehicle would be subject to the Motor Vehicle Standards Act and requires certification and compliance with all applicable ADRs at the time of first registration or supply to the market (refer to Circular 0-4-12 (*Certification of Campervans and Motorhomes*) issued by the Department of Infrastructure and Transport (DIT) for additional information).

The importation of vehicles into Australia is also administered by DIT. Vehicles imported into Australia must possess an import approval issued by that Department. Registration Authorities will not register imported vehicles that do not have the necessary approvals. Therefore to avoid disappointment and unnecessary expenditure, persons wishing to convert unregistered imported vehicles should not do so without ensuring the vehicle/s in question have the necessary valid import approvals.

Further information about certification and importation of vehicles can be found in the DIT website located at:

www.infrastructure.gov.au

Note: Whilst VSB 14 is not intended to cover trailers, much of the information contained within this Code may be applied to the internal construction and fitting-out of caravans. The requirements for the construction of caravans of an Aggregate Trailer Mass (ATM) up to 4.5 tonnes is contained in Vehicle Standards Bulletin N^o 1 *National Code of Practice for Building Small Trailers* which may be downloaded from the following website:

www.infrastructure.gov.au/roads/safety/bulletin/vsb1/index.aspx

DEFINITIONS

The term **motorhome** applies equally to both a *Campervan* and a *Motorhome*.

A **motorhome** is usually a motorised cab/chassis fitted with a body having accommodation facilities and designed for self-contained recreational travel.

A **campervan** is usually a motorised van (for example, a panel van or forward control passenger vehicle) fitted with accommodation facilities and designed for recreational travel (refer to Figure LH11-1 below).



Campervan



Motorhome



Motorhome



Bus Converted to Motorhome

Figure LH14 Examples of Typical Campervans and Motorhomes

The following definition therefore applies:

A **motorhome/campervan** is a motor vehicle manufactured to include accommodation space, which contains at least the following equipment:

- seats, and a table;
- sleeping accommodation, includes seats that may be converted to sleeping accommodation;
- cooking facilities; and
- storage facilities.

This equipment must be rigidly fixed - however, the table may be designed to be easily removable.

Gross Vehicle Mass (GVM) - is the maximum permissible laden mass of a vehicle as specified by the manufacturer. (This figure is normally shown on the vehicle identification plate (compliance plate) or in specifications published by the manufacturer of that vehicle).

Aggregate Trailer Mass (ATM) - the total mass of the laden trailer when carrying the maximum load recommended by the *manufacturer*. This will include any mass imposed on the drawing vehicle when the *combination vehicle* is resting on a horizontal supporting plane.

Tare Mass – mass of a vehicle, other than an L-group vehicle, ready for service, unoccupied and unladen, with all fluid reservoirs filled to nominal capacity, except for fuel, which must be 10 litres only, and with all standard equipment and any options fitted.

Load Capacity –is the difference between the GVM/ATM of the vehicle and its *Tare Mass*.

Gross Axle Load Rating (GALR) - the *manufacturer's* specified maximum *Axle Load* for each *Axle* for which compliance with applicable ADRs has been or can be established.

CONVERSIONS COVERED UNDER CODE LH10

Conversions that are covered under this Code include:

- Conversion of any light vehicle (up to and including 4.5 tonnes GVM) to a campervan or motorhome configuration.

CONVERSIONS NOT COVERED UNDER CODE LH10

Conversions that are not covered under this Code include:

- Building or modifying vehicles that were not previously registered;
- Conversion of a vehicle that does not have the necessary payload capacity to carry the designated number of persons and the equipment; and
- Conversion of a vehicle in excess of 4.5 tonnes GVM to a campervan or motorhome configuration.

COMPLIANCE WITH APPLICABLE VEHICLE STANDARDS

Modified vehicles must continue to comply with the ADRs to which they were originally constructed, except as allowed for in the AVSR. These modified vehicles must also comply with the applicable in-service requirements of the AVSR.

Modified pre-ADR vehicles must continue to comply with the AVSR.

Compliance with the AVSR also means compliance with the equivalent regulations of a State or Territory of Australia.

Outlined below in Table LH6 are areas of the vehicle that may be affected by the modifications and that may require re-certification, testing and/or data to show compliance for the modified vehicle. This is not an exhaustive list and other modifications may also affect ADR compliance.

Table LH6 Summary of items that if modified, may detrimentally affect compliance with applicable ADRs

DETAIL	REQUIREMENTS
Installation of Seats and Seat Anchorages	ADR 3x, 3/... VSB 5A, VSB 5B
Installation of Seatbelts and Seatbelt Anchorages	ADR 4x, 4/... ADR 5x, 5/... VSB 5A, VSB 5B
Child Restraint Anchorages	ADR 5/... ADR 34x, 34/... VSB 5A, VSB 5B
Replacement Windows	ADR 8, 8/...
General Safety Requirements	ADR 42/...
Vehicle Configuration and Dimensions	ADR 43/...
Specific Purpose Vehicle Requirements	ADR 44/...

To determine the ADRs that apply to the vehicle in question, refer to the applicability table in Section LO. Vehicles manufactured on or after 1 January 1969 and prior to 1 July 1988 need to comply with the Second Edition ADRs whilst vehicles manufactured after this date need to comply with the Third Edition ADRs. Section LO has separate applicability tables for each edition.

Alternatively, ADR applicability tables for individual vehicle categories may be referenced on the Department of Infrastructure and Transport *RVCS* website at the following address and under the section titled *ADR Applicability Tables*:

<http://rvcs.dotars.gov.au/>

The ADRs apply according to the vehicle's category and date of manufacture. It is the responsibility of the modifier and the Signatory to refer to the appropriate ADR applicable to the vehicle.

Where a campervan/motorhome conversion results in a change of vehicle category, the modified vehicle must comply with the ADRs applicable to the new vehicle category and the date of manufacture of the original base vehicle.

SPECIFIC REQUIREMENTS

The following are specific requirements that apply to Motorhome Conversions certified under Code LH11.

The conversions must also comply with the general guidelines contained in sub-section 2 *General Requirements*.

1 VEHICLE SUITABILITY

A motorhome must be of a type that is suitable for conversion to the required configuration. Aspects that need to be considered are:

- Is the vehicle's general mechanical and structural condition sound?
- Is there enough space available for seating, bunks, stove, sink, refrigerator and general living requirements?
- Is the payload capacity of the vehicle sufficient to accommodate the additional weight of equipment, accessories, passengers and luggage? and
- What category of driver's licence will be required to drive the vehicle after the conversion?

1.1 Motorhome Gross Vehicle Mass

The motorhome must have a GVM appropriate for its purpose, and must include the following allowances within its laden mass, regardless of the determined Vehicle Category:

- A *Maximum Loaded Vehicle Mass* (of a passenger vehicle) as per the ADR definitions, where reference to a *seating position* means a *designated seating position*;
- The mass of all supplied equipment such as toilets, refrigerators, showers, gas-bottles etc. including the mass of full tanks containing fluids or gas. Where waste (grey and black) water tank/s are provided, their mass may be reduced by the mass of the water stored in any fresh water tank/s; and
- A *Personal Effects Allowance*, to cover cooking utensils, bedding, luggage and other such items, of 60 kg for each of the first two sleeping berths, and 20 kg for each sleeping berth more than two. This must be in addition to that included within the *Maximum Loaded Vehicle Mass* (of a passenger vehicle) above; and

Note: This *laden mass* allowance should be distributed as appropriate to the build of the motorhome as determined by the motorhome manufacturer/modifier, but with the *Personal Effects Allowance* distributed equally per *axle group* for the purpose of determining certified *GALR*.

2 DIMENSIONS

The following dimensions must not be exceeded:

- Maximum length: 12.5 metres;
- Maximum width: 2.5 metres;
- Maximum height: 4.3 metres; and
- Rear overhang: the lesser of 60% of the wheelbase or 3.7 metres.

Items or equipment mounted on the rear of the vehicle (for example toolboxes or a rack to carry a motor cycle or gas bottles) are included in the measurement of rear overhang and overall length.

3 BODY COMPONENTS

Properly fabricated body components, including body panels, must be used for all new, additional or replacement panels.

Equivalent panels and brackets to that utilised on high volume manufactured motorhomes may be used, provided that the panels are at least equivalent material in thickness and strength and attached in accordance with good engineering practice.

Where sharp edges exist, they should be capped with fully welded steel covers or pinch weld or equivalent (refer Figure LH7, Code LH1).

Where panels are intermittently welded, they must be fully sealed to prevent the ingress of exhaust gases into the cabin.

4 MECHANICAL COMPONENTS

If any additional or replacement mechanical components, for example axle(s), suspension or modified braking system are utilised in the conversion, these modifications must be certified under the appropriate Sections of VSB 14.

5 GENERAL SAFETY REQUIREMENTS

Motorhomes must continue to comply with all the applicable standards and ADRs, including the requirements in ADR 42/... and ADR 44/... that apply to these types of vehicles.

The vehicle must not be modified or fitted with any object, fitting or appliance that is likely to cause the risk of bodily injury to any person.

Interior fittings are to be designed and located so as to prevent injury to any occupant. All chairs, tables and equipment should be secured in such a way that they are not likely to become dislodged in normal operating conditions. Sufficient cupboard space should be provided to store all items such as cooking utensils, cutlery and crockery, while travelling. The cupboard doors should be fitted with latches and hinges of sufficient strength to hold the doors closed in normal driving conditions.

Equipment such as stoves, refrigerators, water, fuel and waste tanks should be installed in positions so that:

- the load is evenly distributed;
- no axle or wheel is overloaded; and
- the vehicle remains level.

Motorhome converters should also establish with their relevant State and Territory Registration Authorities whether any additional requirements exist for items such as electrical power systems, remote connections, smoke detectors, fire control etc..

5.1 Lighting

The vehicle must be fitted with lamps that comply with the applicable standards as required in the AVSR.

All mandatory lamps must not be obscured by any equipment or fittings.

Note: As a condition of approval, all converted vehicles must be fitted with direction indicator lamps regardless of the date of manufacture.

5.2 Driver's View

The driver of the vehicle must have a full and uninterrupted view of the road and any traffic ahead and to each side of the vehicle, and by use of rear vision mirrors, a clear reflected view of any following or overtaking vehicle.

5.3 Seating Positions

Note: Refer to Section LK *Seating and Occupant Protection* for more detailed information about the installation of additional seats.

Motorhomes may be configured to provide a number of designated seating positions in addition to the driver and front passenger seats. *Designated seating positions* in this context mean *seating positions* that are equipped to be used whilst travelling. These seats may double in use as seats for dining or recreation and may convert to sleeping-berths. They may also be capable of swivelling to better suit their intended multiple use function.

A motorhome must be fitted with an adequate number of designated seating positions, designed for use while travelling.

The number of designated seating positions must be equal to, or greater than the number of sleeping-berths provided in the motorhome. For example, a motorhome which has four sleeping berths must have at least four seating positions designed for use while travelling.

As far as possible, all the designated seating positions should be forward facing and are those that would most likely be occupied when travelling, such as seats immediately behind the front row of seats, rather than those at the rear of the vehicle.

Swivel seats, if intended to be used as seating positions when travelling, must be capable of being locked against rotation in the position in which they will be occupied when the vehicle is in motion.

If a swivel seat is used in a designated seating position, it must be easily lockable without the use of tools in position(s) as intended for use in transport and ADR compliance must be determined for those locked position(s).

If a swivel seat is able to be locked in a position other than as certified as a *designated seating position*, then a durable and permanent label must be provided in a visible location adjacent to the seat warning prospective users that the seat can only be safely used in certain positions. The label must have lettering that is at least 6mm in height and must display a message similar to that shown in Figure LH15.

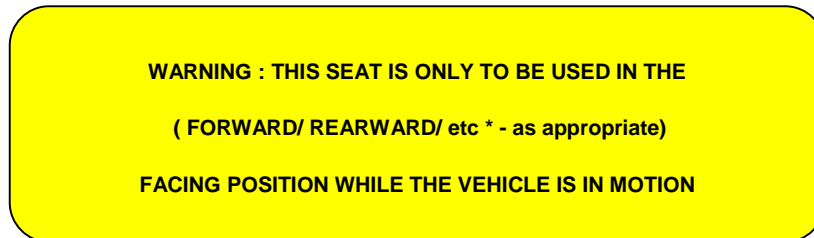


Figure LH15 Warning Label for Swivel Seats

Seats which are additional to the minimum number of seating positions intended for use when travelling, need not comply with seat strength and seatbelt requirements specified. However if these seats are not certified and no seatbelts are fitted, these seats must not be occupied while the vehicle is in motion on public roads.

To warn prospective users of the status of the seats fitted to a motorhome, it is recommended that a durable and permanent label or plaque be fixed in a conspicuous position inside the motorhome. The label must have lettering that is at least 6mm in height and must display a message similar to that shown in Figure LH16. The label should also include a seating plan that identifies with an X, the seats that must not be used when the vehicle is being used on public roads.

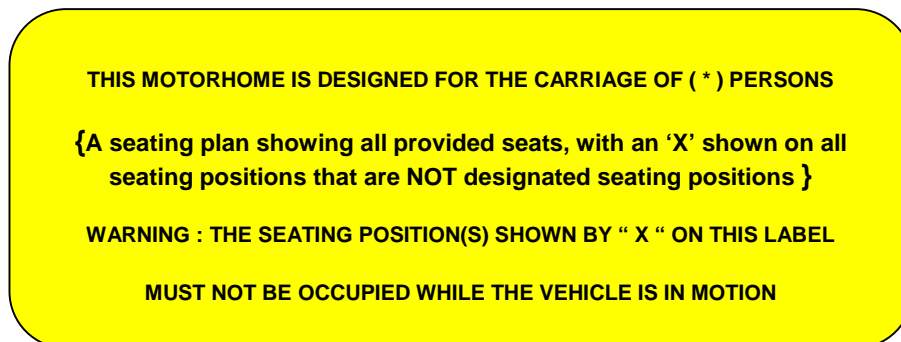


Figure LH16 Warning Label Including Seating Plan (for seats that must not be occupied when the vehicle is being used on public roads)

5.4 Seatbelts

Note: Refer to Section LK *Seating and Occupant Protection* for more detailed information about the installation of Seatbelts and Seatbelt Anchorages.

To determine the vehicle category after conversion, the following calculations must be performed:

- Multiply the number of designated seating positions by 68 kg;
- If the calculated mass is less than 50% of the difference between the GVM and the Unladen Mass then the vehicle is classified as a goods vehicle (provided there is an area available for goods to be carried). The requirements for an NA, NB or NC ADR category vehicle will apply as appropriate; or
- If the calculated mass is more than 50% of the difference between the GVM and the Unladen Mass, then the vehicle is classified as a passenger vehicle. The requirements for a MA, MB, MC or MD ADR category vehicle will apply as appropriate.

The seatbelt fitting requirements depend on the vehicle's ADR category. In most cases, vehicles converted to a motorhome will be in either the MB or MC passenger vehicle categories or in the NA or NB goods vehicle categories.

Seatbelts must be fitted to all designated seating positions. ADR 5/... specifies the type of belt anchorages required depending on the category and age of the vehicle.

The structural integrity of existing seatbelt anchorages must be maintained by ensuring that all original mounting and reinforcing sections are retained.

General requirements for seatbelts are as follows:

- Forward facing seating positions which are within 200mm of the internal sidewall of the vehicle must be provided with lap sash seatbelts;
- Side facing seats must only be fitted with lap type seatbelts; and
- The seatbelts fitted must comply with Australian Standard (AS) 2596.

Seats, in addition to designated seating positions, are not required to be ADR compliant, and do not need to be provided with seatbelts, child-restraint anchorages or any other equipment that may imply they are suitable for use in transport.

Note: Under no circumstances should seatbelts or child restraints be attached to non-complying seats.

5.5 Child Restraint Anchorages

Note: Refer to Section LK *Seating and Occupant Protection* for more detailed information about the installation of Child Restraint Anchorages.

Child restraint anchorages must be fitted if specified for that category of vehicle. If the vehicle has more than one row of seats, a child restraint anchorage is required for each forward facing seat, excluding the front row, up to a total of three.

Where the seat back is divided into two or more sections which may be folded independently of each other and the division lies close to the centre of a seating position, then a child restraint

anchorage must not be fitted for that position.

5.6 Safety Glazing Material and Applied Window Tinting

Requirements for safety glazing materials for windscreens, windows and internal partitions, together with information on window tinting by means of applied surface films are contained in Section LZ *Appendices Appendix G Safety Glazing Material and Applied Window Tinting*.

5.7 Access and Ventilation

Suitable access must be provided to both the travelling and living areas of the motorhome. The motorhome must have outward opening or sliding doors. At least one of these doors must be located on the left hand side or at the rear of the vehicle.

Sufficient ventilation must be provided for all vehicle occupants, both when travelling and stationary. Unless other satisfactory means of ventilation are provided, at least 50% of the windows must be able to be opened.

Adequate permanent ventilation must be provided for all gas appliances.

5.8 Liquefied Petroleum Gas (LP Gas) Installations

The ADRs specify certification requirements for LP Gas used both as a fuel for motor vehicles and also for installed equipment, such as stoves and refrigerators.

Gas operated appliances and gas containers must comply with the requirements of Australian Standard AS 5601 - *Gas Installations*, current at the time of installation.

In addition, any specific installation requirements specified by the appliance manufacturer, such as ventilation, and minimum clearance requirements, must be complied with.

Note: State and Territory jurisdictions responsible for gas installations and/or safety may have specific requirements under their own legislation. Manufacturers/modifiers must abide with these requirements.

5.9 Electrical Installations

Electrical installations must comply with AS/NZS 3001 - *Electrical Installations – Transportable structures and vehicles including their site supplies*, current at the time of conversion.

Note: State and Territory jurisdictions responsible for electrical installations and/or safety may have specific requirements under their own legislation. Manufacturers/modifiers must abide with these requirements.

5.10 Fire Extinguisher

At least one fully charged and maintained fire extinguisher equipped with a hose must be installed in each vehicle in accordance with the latest version of AS 2444 *Portable fire extinguishers and fire blankets - Selection and location*, current at the time of motorhome/campervan conversion, in a position so as to be readily available for use in an emergency (refer to Figure LH17).

Each fire extinguisher must have an AS/NZS 1850 *Portable fire extinguishers – Classification, rating and performance* approval mark, showing it has a fire test rating of at least 5B.

The fire extinguisher mounting bracket(s) must be designed and fitted so that the extinguisher is not likely to become dislodged during normal vehicle operation.

If a fire extinguisher is fitted inside a cupboard, locker or bin the following sign must be affixed in a location adjacent to that enclosure so as to be clearly visible:



The sign must show a white fire extinguisher on a red background with a 5mm white border showing the words *Fire Extinguisher* in letters at least 16mm high.

Detailed requirements for this sign are specified in Australian Standard AS 2444.

Figure LH17 Fire Extinguisher Sign (Illustration Only)

Note: vehicles with multiple living compartments must have a complying fire extinguisher installed in each compartment in a position so as to be readily available for use in an emergency.

5.11 Television and Visual Display Units

Any television receiver or visual display unit and associated equipment must be securely mounted in a position which:

- does not obscure the driver's vision;
- does not impede driver or passenger movement in the vehicle;
- is unlikely to increase the risk of occupant injury; and
- unless it is a driver's aid, has no part of the image on the screen visible to the driver, directly or by reflection, when viewed from the normal driving position.

5.12 Toilets Sinks and Showers

Any toilet, sink or shower fitted to the vehicle must comply with the following:

- The contents of the toilet pan or urinal must not discharge directly onto the road but must empty into an externally vented tank which is securely attached to the vehicle;
- The contents of any basin, sink or shower must not drain into any toilet pan, urinal or into any other tank into which a toilet pan or urinal empties; and
- The toilet, urinal and tank must vent directly to the atmosphere.

6 ROOF MODIFICATIONS

Many campervans have roof modifications to allow occupants to stand upright whilst in the rear of the vehicle. The most popular conversions include *pop-tops* and *high-top* conversions which are known by a variety of commercial names.

These modifications may involve the complete or partial removal of the roof, roof support beams or cant rails. These modifications have the potential to reduce the strength and thus the safety of the vehicle. High-top conversions also have the potential to increase the centre of gravity of

the vehicle if careful attention is not paid to the final design. Designers of this type of modification must ensure that:

- the strength of the roof is maintained with adequate perimeter bracing and roof support beams wherever necessary;
- there are no sharp edges or protrusions as a result of the modifications which may cause injury to occupants of the vehicle;
- the centre of gravity of the vehicle is not increased to the point where handling, and thus the safety of the vehicle, is compromised; and
- removable bunks and mattresses intended for use in the *hi-top* or *pop-top* area can be safely stored or locked down whilst the vehicle is in motion.

7 INSPECTION

An inspection must be carried out on the structurally completed vehicle prior to painting and trimming of all modified areas.

Previously modified vehicles that are being assessed must have all trim etc. removed to allow a thorough inspection of all modified areas.

A final inspection is to be carried out on the converted vehicle when it is in a condition suitable for registration.

8 RECORDS

The signatory must hold a copy of all drawings, specifications, test results and any other data necessary to fully describe the vehicle modifications. Further details of record keeping requirements are specified by the Registration Authorities under their business rules and/or administrative procedures.

CHECKLIST LH11
CAMPERVAN, MOTORHOME CONVERSION
CODE LH11

(N/A=Not Applicable, Y=Yes, N=No)

1.	DESIGN			
1.1	Is the vehicle's general mechanical and structural condition sound?		Y	N
1.2	Is there enough space available for seating, bunks, stove, sink, refrigerator and general living requirements?		Y	N
1.3	Is the payload capacity of the vehicle sufficient to accommodate the additional weight of equipment, accessories, passengers and luggage?		Y	N
1.4	Are all dimensions within regulatory limits?		Y	N
1.5	Are all body components properly fabricated?		Y	N
1.6	Are any additional or replacement mechanical components certified (where necessary) under the appropriate codes of VSB 6?	N/A	Y	N
2.	COMPLIANCE WITH ADRS			
2.1	Does the vehicle continue to comply with all the applicable standards and ADRs, including the requirements in ADR 42/... and ADR 44/... that apply to this vehicle?		Y	N
3.	GENERAL SAFETY REQUIREMENTS			
3.1	Have all relevant requirements of Clause 6 <i>General Safety Requirements</i> of this code been complied with?		Y	N
4.	WORKMANSHIP			
4.1	Is all work, including welding, of satisfactory quality and has all work been performed in accordance with recognised engineering standards?		Y	N

(Continued overleaf)

4.2	Do all fasteners comply with the applicable requirements of Section LZ <i>Appendices - Appendix A Fasteners</i> ?	N/A	Y	N
4.3	Does the quality of welding comply with the applicable requirements of Section LZ <i>Appendices, Appendix C Heating and Welding of Steering Components</i> ?	N/A	Y	N
4.4	Are all panels (where relevant) fully sealed to prevent ingress of exhaust gases?	N/A	Y	N
4.5	Are all sharp edges capped or covered?	N/A	Y	N
5	ROOF MODIFICATIONS			
5.1	Have all issues to do with the fabrication of the roof conversion been adequately addressed?	N/A	Y	N
6.	RECORDS			
6.1	Have complete records of vehicle details and conversion/construction been retained in a manner suitable for auditing?		Y	N

Note: If the answer to any question is **N (No)**, the modification cannot be certified under Code LH11.

CERTIFICATION DETAILS																
Make							Model							Year of Manufacture		
VIN																
Chassis Number (If applicable)																
Brief Description of Modification/s																
Vehicle Modified By																
Certificate Number (If applicable)																
Vehicle Certified By (<i>Print</i>)																
Signatory's Employer (If applicable)																
Signatory's Signature										Date						