

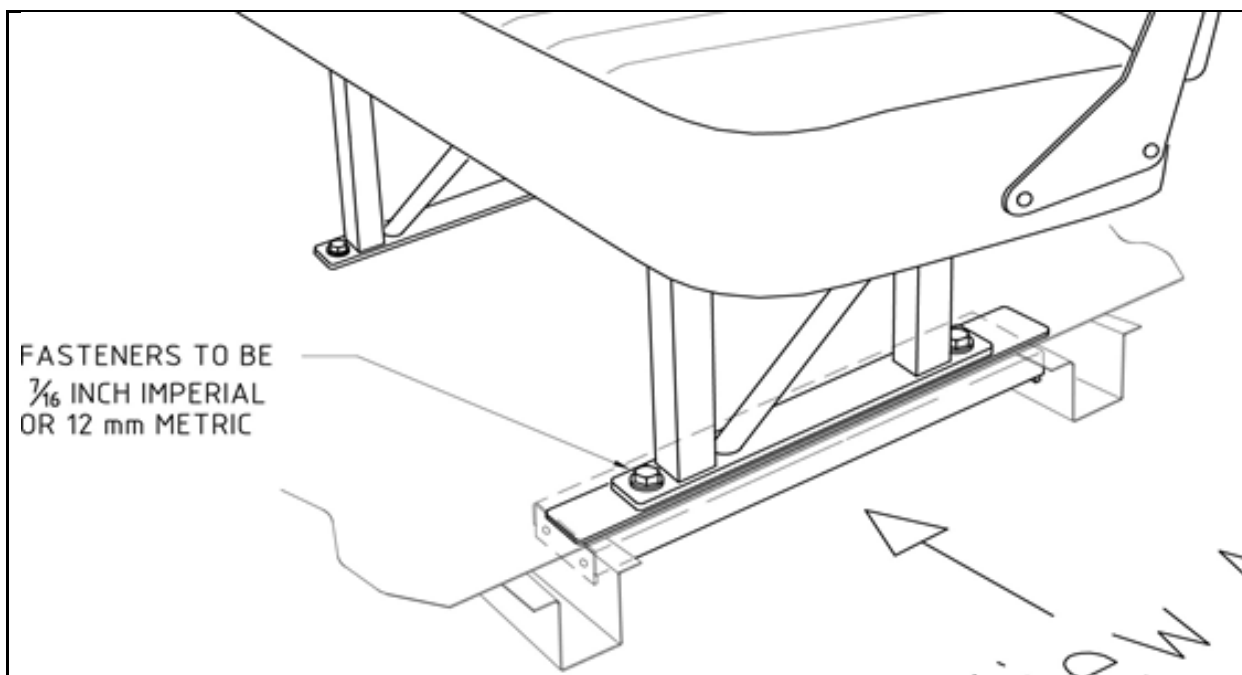
# Low Volume Vehicle Technical Association Incorporated

## Low Volume Vehicle Standard

# **185-00(03)**

## (Seats and Seat Anchorages)

*This Low Volume Vehicle Standard corresponds with: Land Transport Rule 32004: Seats and Seat Anchorages 2002, and Land Transport Rule 32011: Seatbelts and Seatbelt Anchorages 2002.*



### **3<sup>rd</sup> Amendment – effective from: 25 October 2016**

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

### **LVV Standard 185-00 Amendment Record:**

No:	Detail of amendments:	Version:	Issue date:	Effect date:
1	Initial issue – original version	185-00(00)	1 October 2004	1 October 2004
2	1 <sup>st</sup> Amendment	185-00(01)	2 April 2006	2 April 2006
3	2 <sup>nd</sup> Amendment	185-00(02)	1 August 2016	1 August 2016
4	3 <sup>rd</sup> Amendment	185-00(03)	25 October 2016	25 October 2016

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

# Overview

## Background

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

## Availability of low volume vehicle standards

Low volume vehicle standards are developed by the LVVTA, in consultation with the New Zealand Transport Agency, and are printed and distributed by the LVVTA. The standards are available to the public free of charge from the LVVTA website; [www.lvvta.org.nz](http://www.lvvta.org.nz)

Further information on the availability of the low volume vehicle standards may be obtained by contacting the LVVTA at [info@lvvta.org.nz](mailto:info@lvvta.org.nz).

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## Associated information

Other associated information relevant to the subject matter contained in this low volume vehicle standard, which in the interest of comprehensiveness, should be read in conjunction with this standard, includes:

Document	Page #/Section/Chapter
• LVVTA News October-December 2013 Issue 48	Page 5 Testing of Under-spec Doubler Plates
• LVVTA News January-July 2014 Issue 49	Page 9 Landrover Front Row Centre Seating Positions
• LVVTA News August-December 2014 Issue 50	Page 3 Head Restraints in Front of Solid Structures
• LVVTA News May-July 2015 Issue 52	Page 8 New-model Toyota Hiace Seating
• LVV Information Sheet # 05-1999	Frame & Mounting Strength for Additional Seats
• LVV Information Sheet # 12-2000	LVV Certification of Vehicles with Additional Seating Positions
• LVV Information Sheet # 03-2004	Nissan Terrano D21 Rear Seatbelt Anchorage/Floor Rust Problem
• LVV Information Sheet # 02-2005	Nissan Mistral Rear Seatbelt Anchorages

• LVV Information Sheet # 08-2005	Rear Seat Removal and Changing Vehicle Class
• LVV Information Sheet # 02-2006	Track-mounted Seat Attachment Systems
• LVV Information Sheet # 03-2006	Seats & Seatbelts in Motor-homes
• LVV Information Sheet # 07-2009	Removal of Front Seats Fitted with Airbags
• LVV Information Sheet # 02-2012	Aftermarket Sport Seats - General Information
• LVV Information Sheet # 03-2012	Motorhome Seats - General Information
• LVV Information Sheet # 07-2012	Child Seating
• LVV Standard 45-60 (Disability Transportation Systems)	Applicable requirements
• LVV Standard 100-30 (External Projections)	Applicable requirements
• LVV Standard 155-40 (Interior Impact)	Applicable requirements
• LVV Standard 175-00 (Seatbelt Anchorages)	Applicable requirements
• LVV Standard 185-40 (Head Restraints)	Applicable requirements
• NZ Car Construction Manual	Chapter 14 Seats, Seatbelts, & Anchorages
<p>Note that all documents referred to in this table, with the exception of the NZ Car Construction Manual, can be accessed from <a href="http://www.lvta.org.nz">www.lvta.org.nz</a> free of charge. For information on obtaining the NZ Car Construction Manual, contact <a href="mailto:info@lvta.org.nz">info@lvta.org.nz</a></p> <p>Note also that paper copies of documents can become out of date and as such should not be relied upon, therefore LVVTA advises users of this standard to check to ensure that the Associated Information listed here is current, by going to <a href="http://www.lvta.org.nz/standards.html">www.lvta.org.nz/standards.html</a></p>	

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# Seat and Seat Anchorages

**(185-00[03])**

## Purpose of this standard

The purpose of this standard is to specify safety-related requirements for the design, construction, location, and attachment of additional, relocated, or modified seats or seat anchorages, which will increase the likelihood of vehicle occupants being maintained in their seating positions, thereby minimising the chances or severity of injury during a collision.

## Section 1 Scope and application of this standard

### 1.1 Scope of this standard

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

- (a) are retro-fitted with additional seats on or after 1 October 2004; or
- (b) have existing seats relocated or modified on or after 1 October 2004; or
- (c) are modified on or after 1 October 2004 in such a way that any seats or seat anchorages may, directly or indirectly, be affected; or
- (d) are scratch-built on or after 1 October 2004.

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

- (a) powered bicycles of Class AB; or
- (b) motorcycles of Class LA, LB, LC, LD; or
- (c) light trailers of Class TA or TB; or
- (d) those vehicles specified in section 4.

**NOTE:** LE Class trikes fitted with car-style seating must have this LVV standard applied in order to confirm compliance.



## 1.2 Application of this standard

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

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

1.2(2) A light vehicle as in 1.1(1) that has specialised seats or seat anchorages to accommodate the needs of a person with a disability, must comply with the applicable requirements specified within either:

- (a) the *Australian Standard AS2942-1994, Wheelchair occupant restraint assemblies for motor vehicles*; or
- (b) the *Australian Standard/New Zealand Standard 4370:1996, Restraint of children with disabilities in motor vehicles*; or
- (c) the *LVVTA Low Volume Vehicle Standard 45-60 (Disability Transportation Systems)*.

1.2(3) A light vehicle as in 1.1(1) that is operated as a passenger service vehicle must, in addition to complying with this low volume vehicle standard, also comply with the applicable requirements specified within the *Land Transport Rule 31001: Passenger Service Vehicles 1999*.

**NOTE 1:** Where a light vehicle is required to be certified to the *Low Volume Vehicle Code*, but the modification date precedes the date upon which this standard takes effect (1 October 2004), an LVV Certifier must ensure that the vehicle meets the general safety requirements contained in 2.2 of this standard, and should use the applicable technical requirements of *section 2* of this standard as a guideline upon which to base his judgements on the safety of the vehicle.

**NOTE 2:** A light vehicle that is to be operated as a Passenger Service Vehicle (PSV), and is modified in such a way as to become a low volume vehicle, must be certified to both the *Low Volume Vehicle Code* and also to any applicable requirements of the *Land Transport Rule: Passenger Service Vehicles 1999 (Rule 31001) and any subsequent revisions*. In the event of a conflict of requirements, the PSV Rule takes precedence over any contrary requirements found in this LVV standard.

## 1.3 Methods of compliance with this standard

1.3(1) A low volume vehicle must comply with the technical requirements of this standard by meeting either:

- (a) the best-practice designs provided by this standard as referred to in 1.3(2); or
- (b) as a variation to best-practice designs specified in 1.3(2), either:
  - (i) an alternative system which is proven in part by practical testing, as referred to in 1.3(3); or
  - (ii) an alternative system which is proven in part by calculation, as referred to in 1.3(4); or

### Designs specified by this standard

**1.3(2)** The technical requirements of this standard may be complied with by meeting all applicable requirements specified in 2.2 to 2.13.

**NOTE:** Methods of assessing the design of an aftermarket or custom forward-facing stressed seat are not provided for within 2.2 to 2.13 of this standard, therefore such seats may only be assessed by testing or calculation as provided for in 1.2(3) or 1.2(4).

### Alternative systems proven by practical testing

**1.3(3)** The technical requirements of this standard may be complied with, where a specific design solution is required as an alternative to 1.3(2), by:

- (a) meeting all applicable requirements specified in section 2, other than those in 2.5 to 2.12; and
- (b) instead of complying with 2.5 to 2.12, completion of a practical test process of the alternative seat frame and seat attachment system, to demonstrate that either:
  - (i) the applicable specific loading requirements contained in 2.1 have been achieved; or
  - (ii) results directly equivalent to those required by one of the approved standards specified in 2.3 of the *Land Transport Rule 32004: Seats and Seat Anchorages 2002*, or *Australian Code of Practice VSB5A Commercial Manufacture and Installation of Seats* have been achieved;

and

- (c) provision of a complete report of the test process to the low volume vehicle certifier to confirm that the test results required by 1.3(3)(b) have been achieved.

**NOTE:** Seats are often tested on a solid steel bed rather than in a motor vehicle, so the attachment of the seat to the vehicle is not proven. Alternative seat anchorage systems must be supported by engineering justification.

### Alternative systems proven by calculation

**1.3(4)** The technical requirements of this standard may be complied with, where a specific design solution is required as an alternative to **1.3(2)**, by:

- (a) meeting all applicable requirements specified in *section 2*, other than those in 2.5 to **2.12**; and
- (b) instead of complying with 2.5 to **2.12**, completion of engineering calculations of the alternative seat frame and seat attachment system, to confirm that the applicable specific loading requirements contained in 2.1 have been achieved; and
- (c) provision of a **complete** report of the engineering calculation process to the low volume vehicle certifier to confirm that the calculation process required by **1.3(4)(b)** has been carried out.

**NOTE 1:** The requirements contained in **1.3(3)(c)** and **1.3(4)(c)** means that any alternative seat or seat anchorage systems that are a variation to those designs specified in this standard, must be supported by engineering proof to verify that the requirements have been met, including a copy of the engineering report provided to the LVV Certifier. Modifiers should consult with LVVTA to agree the most appropriate parameters for testing or calculation prior to commencing any modification work or verification processes, particularly where any complex or unusual modification or fabrication work is being undertaken.

**NOTE 2:** Modifiers should be aware that it is inappropriate to apply simple hand (engineering) calculations to any panel steel structure, in particular when the area is shaped or is multi-layered. In such cases, practical testing is the appropriate assessment method, or as a minimum standard, finite element analysis calculations carried out by a qualified engineer, with a safety margin appropriate to the situation.

## Section 2 Technical requirements of this standard

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### 2.1 Loading requirements for seats

**2.1(1)** Where the design or attachment of a retro-fitted seat is being proven by practical testing or calculation as in **1.3(3)** or **1.3(4)**, a retro-fitted seat in a low volume vehicle must be designed, constructed, and attached to withstand the appropriate forces, that may deform the seat and surrounding structure to which the seat is attached, but not result in ultimate failure, specified in the applicable requirements in **2.1(2)** to **2.1(10)**.

**NOTE:** The definition of a seat includes the runners or rails that the seat sits upon so that the strength of the seat as a whole is considered.

**Forward-facing unstressed seats**

2.1(2)

A retro-fitted seat that is forward-facing, and does not have seatbelt anchorages attached directly to the seat frame, must be able to withstand:

- (a) in the forward longitudinal direction, 20 times the weight of the seat, applied through the centre of gravity of the seat; and
- (b) in the rearward longitudinal direction, the rearward loadings applied separately, of:
  - (i) 20 times the weight of the seat, applied through the centre of gravity of the seat; and
  - (ii) 900 N for each seating position, applied at the top of the seat-back;

and

- (c) in the sideways direction, 15 times the weight of the seat, applied through the centre of gravity of the seat.

**Forward-facing stressed seats with lap and diagonal seatbelts**

2.1(3)

A retro-fitted seat that is forward-facing, and has lap and diagonal seatbelt anchorages attached directly to the seat frame, must be able to withstand all applicable forward loadings, applied simultaneously, of:

- (a) in the forward longitudinal direction, 20 times the weight of the seat, applied through the centre of gravity of the seat; and
- (b) in the approximate direction of force that could be applied on the seatbelt anchorage by the vehicle occupant during a collision:
  - (i) for each upper seatbelt anchorage with a static lap and diagonal seatbelt, 14kN; and
  - (ii) for each upper seatbelt anchorage with a retractor lap and diagonal seatbelt, 14kN; and
  - (iii) for each upper seatbelt anchorage with a retractor lap and diagonal seatbelt, where the retractor is mounted independently of the upper seatbelt anchorage position, resulting in a combination of loads on the upper seatbelt anchorage, 22 kN; and

- (iv) for each retractor anchorage where the retractor is mounted independently of the upper seatbelt anchorage, 13.6 kN applied in the direction of the upper seatbelt anchorage webbing guide; and
- (v) for the lower seatbelt anchorage that does not have the seatbelt buckle attached, 10 kN; and
- (vi) for the lower seatbelt anchorage that has the seatbelt buckle attached, 15 kN.

2.1(4) In addition to 2.1(3), a retro-fitted seat that is forward-facing, and has lap and diagonal seatbelt anchorages attached directly to the seat frame, must be able to withstand the rearward loadings, applied separately in the rearward longitudinal direction, of:

- (a) 20 times the weight of the seat, applied through the centre of gravity of the seat; and
- (b) 900 N for each seating position, applied at the top of the seat-back.

2.1(5) In addition to 2.1(3) and 2.1(4), a retrofitted seat that is forward-facing, and has lap and diagonal seatbelt anchorages attached directly to the seat frame, must be able to withstand loading, in the sideways direction, of 15 times the weight of the seat, applied through the centre of gravity of the seat.

#### **Forward-facing stressed seats with lap seatbelts**

2.1(6) A retro-fitted seat that is forward-facing, and has lap seatbelt anchorages attached directly to the seat frame, must be able to withstand:

- (a) the forward loadings, applied simultaneously, of:
  - (i) in the forward longitudinal direction, 20 times the weight of the seat, applied through the centre of gravity of the seat; and
  - (ii) in the approximate direction of force that could be applied on the seatbelt anchorage by the vehicle occupant during a collision, for each lower seatbelt anchorage, 15 kN;

and

- (b) in the rearward longitudinal direction, the rearward loadings, applied separately, of:
  - (i) 20 times the weight of the seat, applied through the centre of gravity of the seat; and

- (ii) 900 N for each seating position, applied at the top of the seat-back;

and

- (c) in the sideways direction, 15 times the weight of the seat, applied through the centre of gravity of the seat.

#### **Rearward-facing unstressed seats**

2.1(7) A retro-fitted seat that is rearward-facing, and does not have seatbelt anchorages attached directly to the seat frame, must be able to withstand:

- (a) in the forward longitudinal direction, the simultaneous loading of:
  - (i) 20 times the weight of the seat, applied through the centre of gravity of the seat; and
  - (ii) 16 kN for each seating position, applied uniformly throughout the height of the seat-back area;

and

- (b) in the rearward longitudinal direction, 20 times the weight of the seat, applied through the centre of gravity of the seat; and
- (c) in the sideways direction, 15 times the weight of the seat, applied through the centre of gravity of the seat.

#### **Rearward-facing stressed seats**

2.1(8) A retro-fitted seat that is rearward-facing, and has seatbelt anchorages attached directly to the seat frame, must be able to withstand:

- (a) in the forward longitudinal direction, the simultaneous loading of:
  - (i) 20 times the weight of the seat, applied through the centre of gravity of the seat; and
  - (ii) 16 kN for each seating position, applied uniformly throughout the height of the seat-back area;

and

- (b) in the rearward longitudinal direction, the simultaneous loading of:

- (i) 20 times the weight of the seat, applied through the centre of gravity of the seat; and
- (ii) for each seatbelt anchorage, 40% of the applicable loads specified in 2.1(3) or 2.1(4) for the corresponding type of anchorage in a forward-facing seat, applied in the approximate direction of force that could be exerted on the seatbelt anchorage by the vehicle occupant during a rearward collision;

and

- (c) in the sideways direction, 15 times the weight of the seat, applied through the centre of gravity of the seat.

#### **Sideways-facing unstressed seats**

2.1(9) A retro-fitted seat that is sideways-facing, and does not have seatbelt anchorages attached directly to the seat frame, must be able to withstand:

- (a) in the forward longitudinal direction, 20 times the weight of the seat, applied through the centre of gravity of the seat; and
- (b) in the rearward longitudinal direction, 20 times the weight of the seat, applied through the centre of gravity of the seat; and
- (c) in the sideways direction, 15 times the weight of the seat, applied through the centre of gravity of the seat.

#### **Sideways-facing stressed seats**

2.1(10) A retro-fitted seat that is sideways-facing, and has seatbelt anchorages attached directly to the seat frame, must be able to withstand:

- (a) in the forward longitudinal direction, the simultaneous loading of:
  - (i) 20 times the weight of the seat, applied through the centre of gravity of the seat; and
  - (ii) in the approximate direction of force that could be applied on the seatbelt anchorage by the vehicle occupant during a collision, for each lower seatbelt anchorage, 15 kN;

and

- (b) in the rearward longitudinal direction, the simultaneous loading of:

- (i) 20 times the weight of the seat, applied through the centre of gravity of the seat; and
  - (ii) in the approximate direction of force that could be applied on the seatbelt anchorage by the vehicle occupant during a collision, for each lower seatbelt anchorage, 15 kN;
- and
- (c) in the sideways direction, 15 times the weight of the seat, applied through the centre of gravity of the seat.

NOTE 1:	The specific loading requirements specified in 2.1(2) to 2.1(10) may appear to differ from loading requirements contained within approved international standards. This is because the loads specified in this standard are the likely maximum loads distributed into each individual seatbelt anchorage by a standard 27 kN load, applied through a body block to simulate the loadings that would be applied by the person wearing the seatbelt in the event of a collision.
NOTE 2:	10 kN is a force that can be considered approximately equivalent to a mass of 1000 kg, and a Newton is a force that can be considered approximately equivalent to a mass of 0.1 kg. Therefore, a 22 kN load can be likened to a mass of 2200 kg, and 900 N can be likened to 90 kg.
NOTE 3:	“Applied separately” means the application of two separate tests, each test applying one of the specified loads. “Applied simultaneously” means to apply each of the specified loads together during the same single test procedure.
NOTE 4:	Where ‘in the forward longitudinal direction’ or ‘in the rearward longitudinal direction’ or ‘in the sideways direction’ is referred to in 2.1(2) to 2.1(10), this is to be applied on the horizontal plane.
NOTE 5:	A sideways-facing seat may only be fitted with a lap-only seatbelt.

### **General loading requirements for all seats**

- 2.1(11) The section or structure of any low volume vehicle to which any retro-fitted seat is attached, must be able to withstand the same loading requirements specified in this standard for the seat itself.
- 2.1(12) A seat or seat anchorage must, in addition to the one-off loading requirements specified in 2.1(2) to 2.1(10), be designed, constructed, and attached so as to resist fatigue loadings likely to be applied to the seat or seat anchorage throughout the life of the vehicle to which they are attached.

## **2.2 General safety requirements**

- 2.2(1) A low volume vehicle must:
- (a) be designed and constructed using materials and components that are fit for their purpose; and



- (b) be safe to be operated on the road.

NOTE: The requirements specified in 2.2(1) are selected from 2.3 of *Part 2* of the *Low Volume Vehicle Code*, reproduced here in the interest of convenience, and are over-riding requirements which make it clear that, regardless of what technical requirements are or are not in place, every vehicle certified to the *Low Volume Vehicle Code* must be fit for its purpose, and must be safe.

- 2.2(2) Seats and seat anchorages in a motor vehicle must be safe, strong, in sound condition, in good working order and compatible in strength with each other and with the vehicle's structure.
- 2.2(3) The driver's seat and its anchorages must be designed, constructed and maintained to enable the driver to have proper control of the motor vehicle.
- 2.2(4) Seats and seat anchorages must be securely attached to the motor vehicle's structure.
- 2.2(5) When a seatbelt or any part of a seatbelt is integral to a seat, the seat and the seat anchorages must be compatible in strength with the seatbelt or with that part of the seatbelt attached to the seat, as appropriate.

NOTE: The requirements specified in 2.2(2) to 2.2(5) are the applicable general safety requirements from 2.2 of the *Land Transport Rule 32004: Seats and Seat Anchorages 2002*, which are reproduced here in the interest of convenience.

### 2.3 Positioning requirements for all seats

- 2.3(1) A seat retro-fitted to a low volume vehicle must meet the applicable positioning requirements specified within 2.3 of this standard, except where the vehicle is a *Passenger Service Vehicle*, in which case the requirements in *Land Transport Rule 31001 (Passenger Service Vehicles)* take precedence over any contrary requirements found in this standard.

NOTE: The requirements specified in some parts of this low volume vehicle standard may conflict with the relevant requirements contained within *Land Transport Rule 31001: Passenger Service Vehicles 1999*. Therefore, whilst some situations provided for in this standard are acceptable in a vehicle being operated for private use, it may not be acceptable if the vehicle is used as a passenger service vehicle. A low volume vehicle certifier must be aware of the use, or intended use of the vehicle, and in the case of a passenger service vehicle, be aware that the vehicle is also required to meet the provisions of the *Passenger Service Vehicle Rule*.

#### **General positioning requirements for all retro-fitted seats**

- 2.3(2) A low volume vehicle that was provided by the vehicle manufacturer with airbags, must maintain the same relative position between the top of the seat cushion of the original seat, and the top of the seat cushion of the retro-fitted seat.

2.3(3) With the seat at the mid-point of its longitudinal adjustment and the seatback reclined to a normal driving position, a retro-fitted seat in a low volume vehicle must not cause any seatbelt anchorage to be outside of its permitted area, as specified in the *Low Volume Vehicle Standard 175-00 (Seatbelt Anchorages)*.

2.3(4) A seat fitted to a low volume vehicle for the use of the driver must in all cases be positioned in such a way as to enable the vehicle to be safely operated by a person within the common range of height and stature.

**NOTE 1:** It is not mandatory to have adjustment in the longitudinal direction for a driver's seat, provided that the seat is positioned in such a way as to meet the criteria in 2.3(4), so that the majority of people could safely operate the vehicle.

**NOTE 2:** *LVV standard 100-30 (External projections)* has requirements for driver's vision that may be affected by a seat modification.

### Leg space

2.3(5) Leg space must be provided for a retro-fitted seat fitted to a low volume vehicle forward of each seating position, that:

- (a) is not less than 150 mm in width on either side of the longitudinal centreline of the seat; and
- (b) extends forward from the seat not less than 300 mm, measured from a point at the vehicle floor immediately below the front of the seat cushion; and
- (c) is clear of any nearby sharp edges that may present a risk of injury to an occupant.

### Retro-fitted seats in enclosed cargo areas

2.3(6) A seat may be retro-fitted into an enclosed area of a low volume vehicle that was designed by the vehicle manufacturer for the carriage of cargo, such as in the rear section of a goods van or station wagon, provided that:

- (a) the enclosed area is covered by a permanent rigid roof structure that could be expected to provide to the occupants some roll-over protection; and
- (b) engine fumes are not able to enter the compartment; and
- (c) adequate ventilation is provided for the occupants in the compartment; and
- (d) in the case of a rearward-facing seat, the seat is positioned in such a way that there is not less than 800 mm measured from the H-point, as defined in *Low Volume Vehicle Standard 175-00 (Seatbelt Anchorages)*, to the rear-most interior panel or door.

### Retro-fitted seats in open cargo areas

2.3(7) A seat may be retro-fitted into an open area of a low volume vehicle that was designed by the vehicle manufacturer for the carriage of cargo, such as on the deck or in the tray of a utility or light truck, provided that:

- (a) the seat is not provided for the use of children, and a label stating that the seat is not for the use of children is provided in clear view of each occupant within the seat; and
- (b) roll-over protection is provided for each seating position, extending directly upward not less than 900 mm from the H-point of each seating position, by either:
  - (i) in the case of a rearward-facing seat, the permanent vehicle cab structure, against which the seat is located immediately adjacent to; or
  - (ii) in the case of a forward-facing seat, or a rearward-facing seat located away from the cab, or the cab not being a permanent structure, rollover protection that meets the applicable requirements specified in *Chapter 13 Body Modification of the New Zealand Car Construction Manual*.

**NOTE:** LVVTA recommends the use of a purpose-designed cargo barrier positioned between cargo space and occupant space, wherever seating positions are retro-fitted within a cargo area, for the protection of occupants from cargo movement in the event of a collision.

### Entry and exit from retro-fitted seats

2.3(8) A retro-fitted seat within a low volume vehicle that has a permanent or fixed roof structure, must be located and positioned in such a way that there is sufficient room to enable each occupant to enter and exit the vehicle without assistance.

**NOTE:** The requirement specified in 2.3(8) includes that sufficient access is available to occupants to reach and operate interior door opening handles.

2.3(9) A low volume vehicle that has a permanent or fixed roof structure and more than one row of seats, must incorporate a ready means of entry and exit, by the most direct path practicable, for all rear seat passengers by having either:

- (a) one or more doors adjacent to each row of seating; or
- (b) an aisle space of a width of not less than 300 mm from each row of seating to one or more doors; or

- (c) one or more seats within each row of seating, other than the rear-most seating row, that folds or tilts forward sufficiently to enable ease of entry and exit.

**NOTE:** A seat that tilts forward as referred to in 2.3(9)(c) needs to provide adequate space to allow reasonable access for the type of vehicle. If access is for more than one row of seating or the seats are intended for regular use, then the space provided needs to meet 2.3(9)(b) and be 300 mm wide over the majority of the height.

2.3(10) Where entrance and exit to a seat within a low volume vehicle is accessed across or past a folding or tilting seat section, the control to enable the folding or tilting of the seat or seat section must:

- (a) be positioned on the side of the seat nearest the adjacent door; and
- (b) be within easy reach, and be able to be easily operated by any person relying on the control to assist in exiting the vehicle.

2.3(11) Where a retro-fitted seat is fitted within the area designed by the vehicle manufacturer for the carriage of cargo, in a low volume vehicle that has a permanent or fixed roof structure, and the seat is located in such a way that access to a side door exit is not readily available, the rear cargo door or tailgate must:

- (a) be able to be opened from inside the vehicle; and
- (b) have the opening control for the rear cargo door or tailgate:
- (i) readily identifiable from inside the vehicle; and
- (ii) within easy access from inside the vehicle; and
- (iii) able to be easily operated from inside the vehicle.

### **Aisle-way obstructions**

2.3(12) A low volume vehicle that is a passenger service vehicle, must not have a diagonal section of a seatbelt passing across an aisle-way.

2.3(13) A low volume vehicle that is not a passenger service vehicle, must not have a diagonal section of a seatbelt passing across an aisle-way that is relied upon by rear seat occupants to enter and exit the vehicle, if it could unreasonably hinder the entry and exit of the rear seat occupants.

### **Front row seating configuration conversions**

2.3(14) A low volume vehicle that was provided with a three-person bench seat for the front row by the vehicle manufacturer may be retro-fitted with two individual seats.

- 2.3(15) A low volume vehicle that was provided with two individual seats for the front row by the vehicle manufacturer may be retro-fitted with a centre front row seating position, provided that:
- (a) the centre seat is provided with a lap seatbelt; and
  - (b) in the case of where a permanent part of the vehicle structure exists immediately behind the retro-fitted centre seat, a head restraint that meets the requirements specified in 2.3 of *Low Volume Vehicle Standard 185-40 (Head Restraints)* is fitted; and
  - (c) in the case of where the addition of an occupant in the centre seating position or the presence of a head restraint retro-fitted to a centre seating position could obscure vision through the interior rear view mirror, an external rear view mirror that meets the requirements specified in 2.3 of the *LVVTA Low Volume Vehicle Standard 200-30 (Rear view Mirrors)* is fitted, for the use of the driver, to each side of the vehicle.

NOTE: A vehicle that is fitted by the vehicle manufacturer with airbags, and has been retro-fitted with a front row centre seat, should also be retro-fitted, where practicable, with a lap and diagonal seatbelt for that centre seating position.

## 2.4 Design and construction requirements for all seats

- 2.4(1) A seat retro-fitted to a low volume vehicle must meet the applicable design and construction requirements specified within 2.4 of this standard, in addition to the applicable design and construction requirements specified within *sub-sections 2.5 for unstressed seats, 2.6 for stressed seats and 2.7 for rear-facing seats*.

### Condition and operation requirements for all seats

- 2.4(2) A seat retro-fitted to a low volume vehicle must not be corroded, cracked, or damaged to such an extent that weakening of the frame could occur as a result.
- 2.4(3) A seat retro-fitted to a low volume vehicle must:
- (a) except for a scratch-built low volume vehicle, or a vehicle designed and constructed primarily for motor-sport use, be provided with fixed cushioning over the seat back and seat base; and
  - (b) incorporate sufficient padding over all hard or sharp contactable areas to minimise likelihood of injury to occupants in the event of an impact.

**NOTE:** A scratch-built or motor-sport vehicle is not required to have fixed cushioning, but the seats must still meet interior impact requirements, including having no exposed rigid frame or fittings, or sharp edges. A plastic bucket-style seat is acceptable provided that the surfaces are smooth, and the seat is well supported and sufficiently strong.

2.4(4) A seat retro-fitted to a low volume vehicle must be designed, constructed, and positioned so as to provide:

- (a) in the case of the driver, a suitable seating position and height, which provides the driver with, as far as practicable, the best available view to the front and both sides of the vehicle, from which to comfortably and safely operate the vehicle; and
- (b) a seat-back that is capable of supporting the occupant in the event of:
  - (i) for a forward-facing seat, a rearward collision, or rebound from a frontal collision; and
  - (ii) for a rearward-facing seat, a forward collision, or rebound from a rearward collision.

#### **Retro-fitted seating position dimensions**

2.4(5) A multiple seat retro-fitted to a low volume vehicle must contain:

- (a) in the case of an adult's seat, no more seating positions than the total whole number of times 410 mm can be divided into the total width of the seat; or
- (b) in the case of a child's seat, no more seating positions than the total whole number of times 310 mm can be divided into the total width of the seat, and either:
  - (i) seatbelt manufacturers' labels permanently attached to each child's seatbelt warning seat occupants that the seatbelts are for the use of children only; or
  - (ii) a notice affixed to each adjacent side window, warning seat occupants that the seatbelts are for the use of children only.

**NOTE:** There is no requirement for the minimum width of a single seat, so general safety requirements and good practice must be applied.

#### **Swivel seats**

2.4(6) A seat designed to be operated in more than one orientation during transit that is retro-fitted to a low volume vehicle must incorporate:

- (a) a mechanism that locks the seat securely either in a forward or rearward-facing position whilst the vehicle is being operated; and
- (b) seatbelts that meet one or more of the approved standards specified in schedule 2 of the Land Transport Rule 32011: Seatbelts and Seatbelt Anchorages 2002 appropriate for each position into which the seat can be locked.

NOTE: The requirements specified in 2.4(6) do not apply to a seat that is designed to swivel for the specific purpose of assisting a disabled or elderly person to enter and exit the vehicle, and is locked into one position whilst the vehicle is in motion.

### Side-facing seats

2.4(7) A side-facing seat must not be retro-fitted to any low volume vehicle, except for in the case of:

- (a) a motor caravan, provided that:
  - (i) there is no more than one side-facing seat on each side of the vehicle; and
  - (ii) there is no adjacent sidewall or object capable of being contacted by the occupant in the event of an impact within 750 mm of the longitudinal centreline of the seat; and
  - (iii) any adjacent sidewall or object capable of being contacted by the occupant in the event of an impact within 1 metre of the longitudinal centreline of the seat is covered with a high-density energy-absorbing material;

and

- (b) an adventure tourism vehicle, provided that:
  - (i) the vehicle operates on a certificate of fitness; and
  - (ii) the vehicle is operated primarily off-road;

and

- (c) a stretched limousine, provided that:
  - (i) the vehicle operates on a certificate of fitness; and
  - (ii) the vehicle is operated primarily for urban passenger service;

and

- (d) a vehicle for which an equivalent make and model was or is sold new in New Zealand, which were or are manufactured with one or more side-facing seats, provided that:
- (i) the side-facing seats replicate the configuration and positioning of the New Zealand-new variant; and
  - (ii) there is no more than one side-facing seat on each side of the vehicle;

and

- (e) a vehicle used for the provision of emergency or prison services, or for training in the provision of emergency services.

**NOTE 1:** A side-facing seat is considered throughout the world in almost all standards jurisdictions to be significantly less safe than a forward or rearward-facing seat. One single side-facing seat on its own is considered to be less unsafe than two or more side-facing seats positioned beside each other, because of the potential head-strike situation that arises in a multiple side-facing seat situation.

**NOTE 2:** Because of the inherent safety risks associated with side-facing seats, it is likely that either the retro-fitting of them will be phased out entirely in the future, or additional restraint and protection systems will be introduced for all future side-facing seat installations.

2.4(8) A side-facing seat must meet the same 'A-zone' interior impact requirements specified within *Low Volume Vehicle Standard 155-40 (Interior Impact)* as any other seating position.

#### Head restraints

2.4(9) A seat retro-fitted to a low volume vehicle, or a seat fitted to a scratch-built low volume vehicle, must be fitted with a head restraint that meets the requirements specified in 2.3 of *Low Volume Vehicle Standard 185-40 (Head Restraints)* if:

- (a) the seat is a rearward-facing seat; or
- (b) in the case of a forward-facing seat, a solid structure is positioned within 300 mm from the rearmost part of the seat-back.

2.4(10) Where a head restraint incorporated within an additional or repositioned seat fitted to a low volume vehicle obscures rear vision through the interior rear view mirror, one or more external rear view mirrors that comply with the requirements specified in 2.3 of *Low Volume Vehicle Standard 200-30 (Rear View Mirror)* must be fitted.



### Hinging and latching mechanisms

2.4(11)

A retro-fitted seat that was manufactured by a production vehicle manufacturer and which meets the requirements in 2.5(2) or 2.6(2), that incorporates a latching mechanism to enable reclining, folding, or tilting, may be fitted to a low volume vehicle providing that:

- (a) the seat is not modified; and
- (b) the positioning and attachment of the seat replicates as closely as practicable the positioning and attachment of the seat in its original application; and
- (c) in the case of a stressed seat, the seatbelts fitted to the seat are the same type as those originally fitted to the seat by the vehicle manufacturer.

2.4(12)

A retro-fitted seat in a low volume vehicle, except for a seat specified in 2.4(11), that reclines, folds, or tilts, must:

- (a) incorporate a latching mechanism that holds the seat securely and rigidly in the latched position; and
- (b) incorporate folding, tilting and latching mechanisms that operate smoothly and freely; and
- (c) in the case of a latching system;
  - (i) lock into place automatically; and
  - (ii) be readily accessible and operable; and
  - (iii) release easily;

and

- (d) comply with the requirements specified in *Low Volume Vehicle Standard 155-40 (Interior impact)* when deployed and folded; and
- (e) including the presence of any floor anchorages or mounts, not present a tripping hazard when the seat is folded.

2.4(13)

A retro-fitted seat that was not manufactured by a production vehicle manufacturer, which incorporates a latching mechanism to enable reclining, folding, or tilting, must have a latching mechanism that is designed and constructed to withstand the forces that would be applied to it when the seat is subjected to the applicable loading requirements specified in 2.1.

**NOTE:** The hinge strength of a reclining, tilting, or folding seat is critical in providing back support in the event of a rearward collision, or rebound from a frontal collision. The torque effect from a load occurring at the top of the seat back applied through the hinge mechanism is substantial, and the torque that the reclining, tilting, or folding mechanism may need to be able to withstand can be in excess of 530 Nm. (This is approximately equivalent to 53 kg applied at the end of a one metre long lever).

## 2.5 Design and construction requirements for unstressed forward-facing seats

2.5(1) An unstressed forward-facing seat, which is a seat that does not have seatbelt anchorages incorporated within the seat structure, must meet the applicable requirements specified in 2.5 of this standard.

### **Forward-facing unstressed seats from production vehicles**

2.5(2) An unstressed forward-facing seat from a production vehicle may be retro-fitted to a low volume vehicle, provided that:

- (a) the vehicle to which the seat was originally fitted was a light vehicle of class MA, MB, MC, MD1, MD2 or NA, manufactured in either:
  - (i) Australia on or after 1 January 1988; or
  - (ii) the United States of America on or after 1 January 1968; or
  - (iii) Europe on or after 1 January 1974; or
  - (iv) Japan on or after 1 January 1983; or
  - (v) any other country on or after 1 January 2000;

and

- (b) where the seat is not attached using the applicable requirements in 2.8 to 2.12, the seat is attached so as to replicate, so far as is practicable, the installation method employed by the donor vehicle manufacturer; and
- (c) the seat is not modified in such a way as to reduce the original strength or rigidity of the seat structure.

**NOTE:** Replacement of an unstressed seat with a seat from the same model and series of vehicle that fits onto OE mounts is considered to be under the threshold for certification and is an acceptable modification, regardless of the date of vehicle manufacture, provided that the requirements of 2.5(3) are met.

**After-market forward-facing unstressed seats**

- 2.5(3) An after-market forward-facing unstressed seat may be retro-fitted to a low volume vehicle, provided that the seat is:
- (a) designed specifically for automotive use; and
  - (b) manufactured by a company professionally engaged in the automotive seat manufacturing industry; and
  - (c) rigidly constructed; and
  - (d) in good condition.

**NOTE:** 2.5(3)(c) can be established by assessing through a physical inspection that the amount of fore/aft and twisting movement that can be achieved at the top of the seat back is minimal, and that the seat back would be of sufficient strength to withstand a 900N rearward load as described in 2.1(2)(b). A seat that meets a recognised motor-sport standard such as FIA or SFI meets these requirements.

- 2.5(4) An aftermarket forward-facing unstressed seat must not be retro-fitted to a low volume vehicle if it has any visible signs of deterioration or repair that could compromise the integrity of the seat structure strength.

**Custom one-off forward-facing unstressed seats**

- 2.5(5) A custom one-off forward-facing unstressed seat may be retro-fitted to a low volume vehicle, provided that the seat is either:
- (a) able to be assessed as being at least as strong in comparison to a seat specified in 2.5(2) or 2.5(3), taking into account design, material specifications, and construction methods; or
  - (b) accompanied by documented evidence of engineering reports or test results to substantiate that the seat is able to meet the applicable loading requirements specified in 2.1; or
  - (c) tested and approved for motor sport use by a testing organisation recognised by the LVVTA.

**NOTE:** Where a seat is constructed on a one-off basis using composite materials, other than straight-forward hand lay-up glass-reinforced plastic (fibreglass), a satisfactory level of competence in the use of the material types incorporated within the construction of the seat may be required to be demonstrated or proven to the LVV certifier

- 2.5(6) A custom one-off forward-facing unstressed seat must not be retro-fitted to a low volume vehicle if it has any visible signs of deterioration or repair that could compromise the integrity of the seat structure strength.

- 2.5(7) An unstressed seat from sources other than those specified in 2.5(2), 2.5(3), or 2.5(5), including a custom one-off seat built into the body structure, may be fitted to a low volume vehicle, provided that there is a bulkhead or part of the outer body structure immediately behind the seat to support the seat in the event of a rearward impact, or a rebound load during a frontal impact.

**NOTE:** The requirement specified in 2.5(7) means, for example, that a 1950s seat could be used in something like an AC Cobra replica, or a period special, providing the seat is against, or close to, the rear bulkhead, or part of the outer body structure.

## 2.6 Design and construction requirements for stressed forward-facing seats

- 2.6(1) A stressed forward-facing seat, which is a seat that has seatbelt anchorages incorporated within the seat structure, must meet the applicable requirements specified in 2.6 of this standard.

**NOTE:** A seat that has seatbelt anchorages incorporated within the seat structure is not considered to be a stressed seat if the seatbelt anchorages are at, or within 75 mm of, the bottom (floor level) of the seat frame, provided that the seatbelt load path is a straight line to the anchorage and not applying any loading to the seat. In this case, the seat anchorages need to be upgraded from the 8 mm specified for an unstressed seat to four 7/16 or 12 mm fasteners.

### Forward-facing stressed seats from production vehicles

- 2.6(2) A forward-facing stressed seat from a production vehicle may be retro-fitted to a low volume vehicle, provided that:

- (a) the vehicle to which the seat was originally fitted was a light vehicle of class MA, MB, MC, MD1, MD2 or NA, manufactured in either:
- (i) Australia on or after 1 January 1988; or
  - (ii) the United States of America on or after 1 January 1968; or
  - (iii) Europe on or after 1 January 1974; or
  - (i) Japan on or after 1 January 1983; or
  - (iv) any other country on or after 1 January 2000;

and

- (b) the seatbelts fitted to the seat are the same seatbelt type as those fitted to the seat within the seat's original application; and
- (c) where the seat is not attached using the applicable requirements for stressed seats in 2.8, 2.10, and 2.11, the seat is attached so as to identically replicate the installation method employed by the donor vehicle manufacturer, including the strength of the surrounding vehicle structure; and
- (d) any seatbelt anchorages that are fitted to the seat frame were installed by the manufacturer of the seat; and
- (e) the seat is not modified in such a way as to reduce the original strength or rigidity of the seat structure.

**NOTE:** The loads transmitted into the vehicle from a stressed seat are considerable, so replication of a vehicle manufacturer's seat installation, which may incorporate multiple panel layers, floor shaping and structural members, must be done accurately in order to ensure that there is sufficient strength. Some vehicle structures may need to be reinforced in order to be comparable.

#### **Forward-facing stressed after-market or custom one-off seats**

2.6(3) A forward-facing stressed after-market or custom one-off seat may be retro-fitted to a low volume vehicle, provided that either:

- (a) the seat complies with one or more of the approved standards specified in 2.3 of the *Land Transport Rule 32004: Seats and Seat Anchorages 2002*; or
- (b) either:
  - (i) the seat structure can withstand the applicable loads specified in 2.1, evidence of which is substantiated by an engineering report that details the test results; or
  - (ii) in the case of a steel seat frame fitted to a motorhome which incorporates a lap seatbelt, the construction of the seatbelt anchorage system meets the design detailed in *LVVTA Information Sheet # 03-2012 (Motorhome Seats - General Information)*.

#### **Seatbelt type changes to stressed seats**

2.6(4) A stressed seat from a production vehicle, to which the vehicle manufacturer fitted one or more lap seatbelts, if required to be retro-fitted with lap and diagonal seatbelts, must either:

- (a) have testing or engineering calculations carried out to confirm that the seat frame can withstand the applicable loads specified in 2.1; or
- (b) have the lower seatbelt anchorages removed from the seat structure, and together with the upper seatbelt anchorage from the retro-fitted seatbelt, be fitted directly to the vehicle structure in accordance with the requirements specified in *Low Volume Vehicle Standard 175-00 (Seatbelt Anchorages)*.

NOTE: When an upper seatbelt anchorage is retro-fitted into a vehicle structure, where a stressed seat originally manufactured with lap seatbelts incorporated within the seat structure is positioned, that seat structure may not necessarily be capable of withstanding the changed direction and magnitude of loading transmitted into the seat frame. Therefore, an original stressed seat positioned in its original location, using the original seatbelt configuration, can be considered acceptable, however, upon the fitting of a different type of seatbelt, the seat can no longer be assumed to be acceptable.

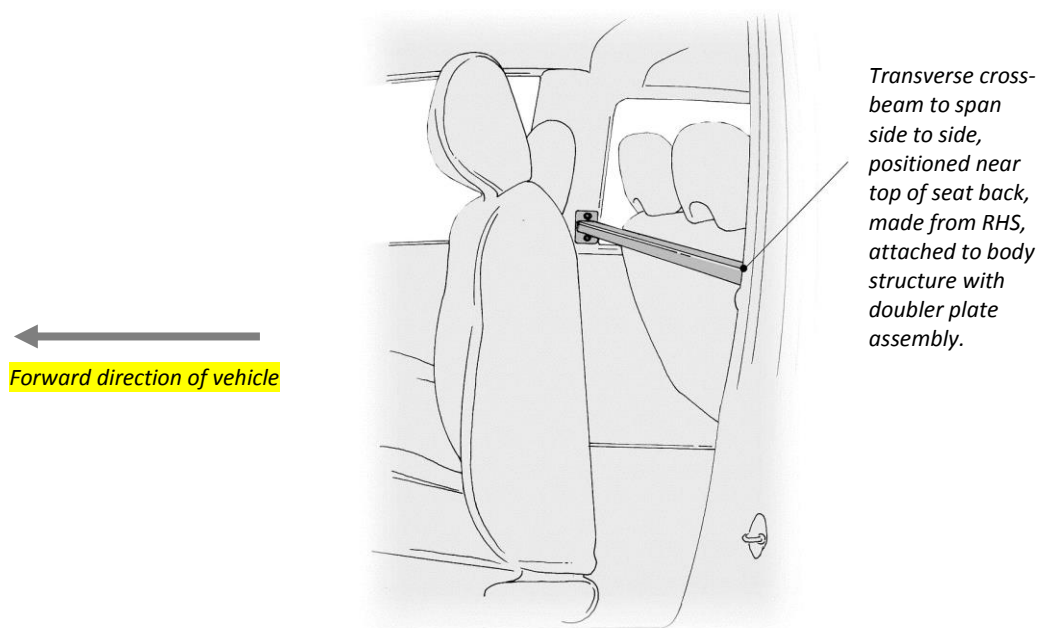
## 2.7 Design and construction requirements for rearward-facing seats

### Seatback support options for rearward-facing seats

- 2.7(1) A rearward-facing seat retro-fitted to a low volume vehicle must, in order to be able to withstand the loadings that could be applied to the seat back in the event of a frontal collision, either:
- (a) be designed to meet the applicable loading requirements for a rearward-facing seat specified in 2.1(7) or 2.1(8); or
  - (b) in the case of a seat that does not meet 2.7(1)(a), either:
    - (i) be supported by an independent transverse cross-beam that meets the requirements specified in 2.7(2) to 2.7(4) of this standard; or
    - (ii) be supported by a seat-back support structure that meets the requirements specified in 2.7(5) and 2.7(6) of this standard.

### Transverse cross-beams for rearward-facing seats

- 2.7(2) An independent transverse cross-beam fitted to a low volume vehicle, to support a retro-fitted rearward-facing seat, must be positioned across the width of the vehicle, immediately forward of the rearward-facing seat, **near** the top of the seat structure, and be manufactured from: [see *diagram 2.7(2)*]
- (a) in the case of a cross-beam that spans a distance of less than 1600 mm; a square hollow steel section of a size not less than 65 mm x 65 mm x 3 mm; or
  - (b) in the case of a cross-beam that spans a distance of more than 1600 mm, a square hollow steel section of a size not less than 65 mm x 65 mm x 5 mm.



**Diagram 2.7(2): Transverse cross-beam attachment**

**NOTE:** The cross-beam specified in 2.7(2) needs to be as close to the back of the rear-facing seat as possible in order to limit seat-back movement, provide maximum support, and minimise any floor deformation.

The cross-beam should not be placed too high up at the top of the seat back, or the seatback could slip underneath it and collapse.

- 2.7(3) An independent transverse cross-beam fitted to a low volume vehicle, to support a retro-fitted rearward-facing seat, must be attached to the vehicle structure with: [see *diagram 2.7(2)*]
- (a) not less than two fasteners at each end of the cross-beam that meet the requirements specified for fasteners in 2.8(19) and 2.8(20); and
  - (b) for each fastener, a doubler plate assembly or an under-floor mounting plate positioned at each end of the cross-beam, on the opposite side of the vehicle structure surface to which the cross-beam is attached, that:
    - (i) has a minimum surface area of not less than 4000 square mm, with not less than 50 mm in width; and
    - (ii) meets the requirements specified for a doubler plate assembly or an under-floor mounting plate in 2.9.
- 2.7(4) A seat fitted to a low volume vehicle that is supported by a transverse cross-beam as specified in 2.7(2) and 2.7(3), must incorporate within the seat-back frame a securely attached vertical support that:

- (a) is manufactured from 200 mm x 3 mm flat-steel bar; and
- (b) spans the height of the seat-back in the centre of each seating position.

#### **Seat-back support structures for rearward-facing seats**

2.7(5) An independent seatback support structure fitted to a low volume vehicle, to support a retro-fitted rearward-facing seat, must: [see *diagram 2.7(5)*]

- (a) be positioned immediately forward of the rearward-facing seat; and
- (b) incorporate a perimeter frame that follows the shape of the seat-back, manufactured from a steel section of no less than either:
  - (i) 25 mm x 25 mm x 3 mm rectangular hollow section; or
  - (ii) 31.8 mm x 2.9 mm round section;

and

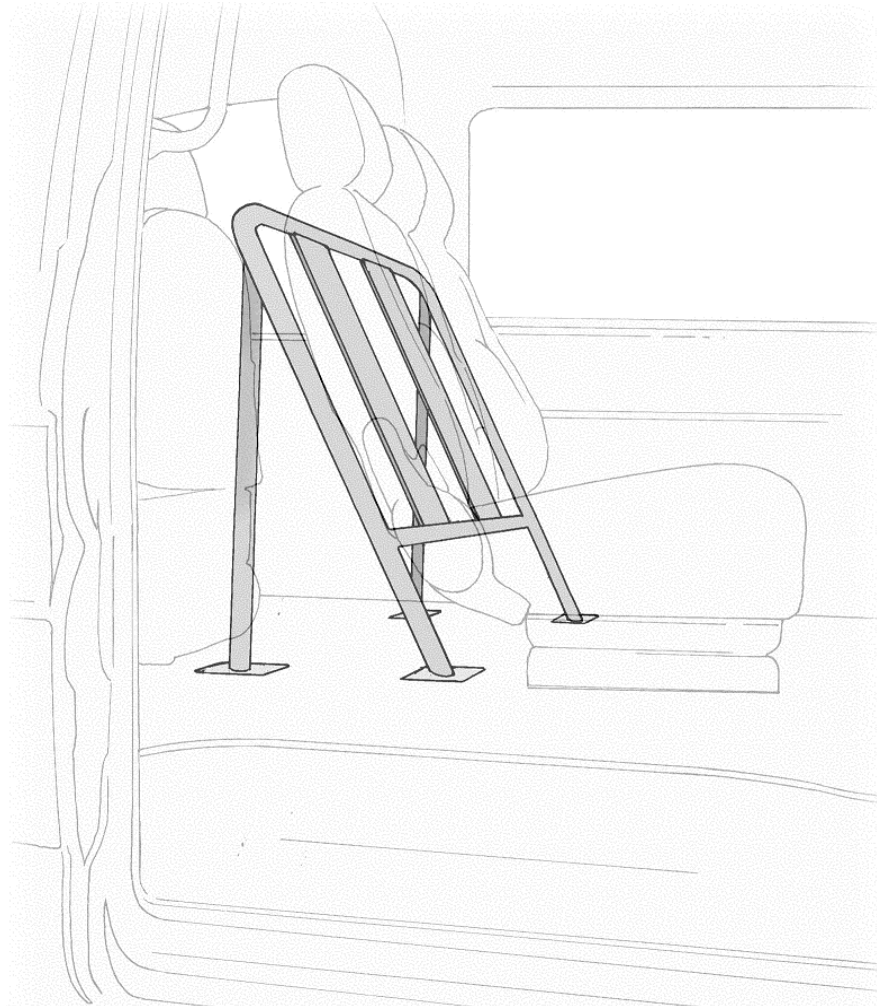
- (c) incorporate, to support the perimeter frame, a rearward or forward brace positioned on each side of the seat frame that:
  - (i) is manufactured from a steel section of no less than 25 mm x 25 mm x 3 mm rectangular hollow section, or 31.8 mm x 2.9 mm round section; and
  - (ii) attaches to the perimeter frame at a height as near as practicable to the top of the perimeter frame; and
  - (iii) runs from the perimeter frame at an angle of not less than 20 degrees;

and

- (d) incorporate for each occupant seating position, either:
  - (i) a securely attached fixed steel vertical back support, of not less than 200 mm x 3 mm flat bar section, positioned in the centre of each seating position, that spans from the top of the perimeter frame to the seat base or floor; or
  - (ii) a securely attached fixed sheet-metal back support that encloses the perimeter of the seat-back support structure.



**NOTE:** The seat-back support structure specified in 2.7(5) needs to be as close to the back of the rear-facing seat as possible in order to limit seat-back movement, provide maximum support, and minimise any floor deformation.



**Diagram 2.7(5): Seat-back support structures for rearward-facing seats**

- 2.7(6) A seatback support structure fitted to a low volume vehicle, to support a retro-fitted rearward-facing seat, must be attached to the vehicle floor at four points, using at each point:
- (a) not less than two fasteners that meet the requirements specified for fasteners in 2.8(19) and 2.8(20); and
  - (b) for each fastener, a doubler plate assembly or an under-floor mounting plate on the opposite side of the vehicle floor to which the seat-back support structure is attached, that:
    - (i) has a minimum surface area of not less than 4000 square mm, with not less than 50 mm in width; and

- (ii) meets the requirements specified for a doubler plate assembly or an under-floor mounting plate in 2.9.

NOTE 1: The back of a rearward-facing three-position seat can, in a frontal collision, be subjected by the seat occupants of loads up to the equivalent of around five tons, which clearly shows that a seat originally designed as a forward-facing seat is not safe when turned around into a rearward-facing position without adequate supporting of the seat back. The LVVTA recommends, where a rearward-facing seat is retro-fitted, the use of a seat-back support structure as specified in 2.7(5) and 2.7(6), rather than a transverse cross-beam as specified in 2.7(2) and 2.7(3), as a seat-back support structure will spread the load of a failing seat-back over a greater area than a transverse cross-beam.

NOTE 2: Another major problem with rearward-facing seats is that in many cases there will be no structure to prevent against extrusion of occupants through the seatback during a frontal collision. Again, in the event of a frontal collision, a seat-back support structure will retain an occupant in the seat far more effectively than a transverse cross-beam.

## 2.8 Attachment requirements for all seats

2.8(1) A seat retro-fitted to a low volume vehicle must be attached to either:

- (a) where practicable, anchorages incorporated by the vehicle manufacturer for the attachment of the same configuration of seats being retro-fitted, within the required location; or
- (b) where no anchorages have been incorporated by the vehicle manufacturer or where the seats being retro-fitted are of a different configuration or positioned in a different location, seat anchorages that meet the applicable requirements specified in 2.8.

NOTE: Where 'configuration' is referred to in 2.8(1)(b), this includes whether or not a seat is stressed or unstressed.

### Attachment requirements for all seats

2.8(2) A seat that is retro-fitted to a low volume vehicle must be attached in a manner that provides no less strength and durability than would be expected to be provided for the applicable seat style, weight, configuration, and location by a modern production vehicle manufacturer.

NOTE: Wherever possible, a seat should be attached to, or as close as possible to, a chassis or sub-frame section, or other load-bearing structural member. The location or attachment method must be strong enough to support 20 times the weight of the seat, plus the load applied by any seatbelt anchorages.

2.8(3) The surface of the area of a low volume vehicle to which a retro-fitted seat or any part of a retro-fitted seat attachment system attaches, must be free from any sound deadening or other compressible material to ensure that a full contact is made.

- 2.8(4) Crush-tubes or packers made from a mild steel or aluminium material must be used as spacers to eliminate compressible air-gaps and ensure that a metal-to-metal contact is made where a retro-fitted seat or any part of a retro-fitted seat attachment system attaches to an uneven surface in a low volume vehicle such as a floor-pan with corrugations.
- 2.8(5) Air gaps between two floor or panel surfaces of a low volume vehicle to which a seat is retro-fitted may not be modified by hammering, but must be eliminated by either the installation of a packer, or by the two surfaces being pulled firmly together.
- 2.8(6) The installation and attachment of a retro-fitted seat to a low volume vehicle must not involve any associated modifications that could weaken the vehicle structure.
- 2.8(7) A seat that is fitted to a low volume vehicle must not be attached directly to, or be supported by, a floor that is made of any type of wooden material, including plywood.
- 2.8(8) A seat base in a low volume vehicle must be securely located or attached so that it cannot move forward or rearward, or become dislocated, during an impact.

**NOTE:** Seats fitted to a docking system, such as that designed for use with a wheelchair, must only be fitted to a disability vehicle and must meet the applicable requirements in *LVV Standard 45-60 (Disability Transportation Systems)*

### Attachment requirements for forward-facing unstressed seats

- 2.8(9) A forward-facing unstressed seat must be attached to the vehicle with:
- (a) not less than four fasteners, positioned as far toward the outer corners of the seat frame structure as practicable, that meet the requirements specified for fasteners in 2.8(19) and 2.8(20); and are of equal or greater size and strength than either:
    - (i) 5/16 inch UNF grade-5 imperial; or
    - (ii) 8 mm grade-8.8 metric; or
    - (iii) in the case of a seat that has seatbelt anchorages incorporated into the seat frame within a distance of 75 mm from the bottom (floor level) of the seat frame, 7/16 inch UNF grade-5 imperial or 12 mm grade-8.8 metric;

and

- (b) for each fastener, a doubler plate assembly or an under-floor mounting plate positioned on the underside of the vehicle structure, that meets the requirements specified for a doubler plate assembly or an under-floor mounting plate in 2.9.

**NOTE:** Where the number of fasteners is greater than four, any additional fasteners must be positioned toward the part of the seat that is applying an upward loading on the floor in the event of a frontal collision, meaning the rear of a forward-facing seat, and in the case of a rearward-facing seat, the part of the seat positioned nearest the back of the vehicle.

### Attachment requirements for forward-facing stressed seats

#### 2.8(10)

A floor section of a low volume vehicle, to which a stressed forward-facing seat is attached, must be either:

- (a) designed by the vehicle manufacturer to be fitted with stressed seats of the same configuration; or
- (b) directly comparable in specification to the floor of a vehicle that was designed by the manufacturer to be fitted with stressed seats of the same configuration; or
- (c) sufficiently reinforced so as to enable the floor to withstand the loads that could be applied to the floor section by the seat in the event of a frontal collision.

**NOTE:** Where 'configuration' is referred to in 2.8(10), this includes the number and type of seatbelt anchorages attached to the seat.

### Attachment requirements for forward-facing stressed seats with lap-only or buckle-only seatbelt anchorages

#### 2.8(11)

A stressed lap-only or buckle-only forward-facing seat that is retro-fitted to a low volume vehicle must be attached to the vehicle by the use of either:

- (a) a system, including fasteners, that directly replicates the installation of the seat as attached into the vehicle to which the seat was originally fitted; or
- (b) a stressed seat over-floor mounting bar system that meets the requirements specified in 2.10; or
- (c) an underfloor channel system that meets the requirements specified in 2.11.

### Attachment requirements for forward-facing stressed seats with lap and diagonal seatbelts

#### 2.8(12)

A stressed lap and diagonal forward-facing seat that is retro-fitted to a low volume vehicle must be attached:

- (a) by the use of either:
  - (i) a stressed seat over-floor mounting bar system that meets the requirements specified in 2.10; or
  - (ii) an underfloor channel system that meets the requirements specified in 2.11;

and

- (b) where practicable, to the vehicle structure in such a way that the loads that could be applied to the seat structure in the event of a collision will be transmitted directly to the chassis or sub-frame longitudinal members, or where this cannot be achieved, to the chassis or sub-frame cross-members.

**NOTE:** A stressed seat with lap and diagonal seatbelts can apply up to 4 times the loading in differing directions on the floor section of a vehicle than a stressed seat with lap-only seatbelts, due to changes in direction and magnitude of loadings, therefore it is important to make every effort to tie such seats into structural sections of the vehicle rather than relying on just the floor surface.

### Attachment requirements for commercially-manufactured after-market forward-facing stressed seats

#### 2.8(13)

A commercially-manufactured forward-facing stressed after-market seat may be retro-fitted to a low volume vehicle, provided that either:

- (a) the seat is attached in accordance with the applicable requirements for forward-facing stressed seats specified in 2.8(10) to 2.8(12); or
- (b) the seat is:
  - (i) attached to the vehicle structure in such a way as to meet the applicable loading requirements specified in 2.1; and
  - (ii) installed using all necessary installation hardware, including plates and fasteners provided or specified by the manufacturer of the seat, to enable correct attachment of the seat to the vehicle; and

- (iii) supplied with complete, comprehensive, and easily understood installation specifications and instructions provided by the manufacturer of the seat, covering the make and model of vehicle to which the seat is retro-fitted; and
- (iv) supported by a complete report of the test process, that is provided to the LVV Certifier, which confirms that the test results required by 2.8(13)(b)(i) have been achieved.

**NOTE:** It is the responsibility of a manufacturer of aftermarket stressed seats to fully assess the loadings that the seats could apply to the vehicle structure, and provide full installation instructions and attachment hardware (or specify what attachment hardware is required to be used) to suit the specific application.

### Attachment requirements for rearward-facing unstressed seats

**2.8(14)** A rearward-facing unstressed seat that is retro-fitted to a low volume vehicle must either:

- (a) in the case where a seat is designed to meet the applicable loading requirements for a rearward-facing seat specified in 2.1(7) or 2.1(8), be attached to the vehicle by a system that meets the requirements in 2.8(12) for a forward-facing stressed seat; or
- (b) in the case where a seat is installed directly behind either a transverse cross-beam that meets the requirements in 2.7(2), 2.7(3) and 2.7(4) or a seat-back support structure that meets the requirements in 2.7(5) and 2.7(6), be attached to the vehicle by a system that meets the requirements in 2.8(9) for a forward-facing unstressed seat.

### Attachment requirements for rearward-facing stressed seats

**2.8(15)** A rearward-facing stressed seat that is retro-fitted to a low volume vehicle must be attached to the vehicle by a system that meets the requirements in 2.8(12) for a forward-facing stressed seat.

**NOTE:** In the case of a rearward-facing stressed seat, the over-floor mounting system must be positioned in reverse (in relation to the seat) to that shown in *Diagram 2.10(3)*, with seating reference 1 and seating reference 2 reversed, so that the 3 mounting plate fasteners in the diagram that are behind the seat back, are, in the case of a rearward-facing seat, in front of the seat back. Put more simply, a seat using an over-floor mounting system, must always have one fastener toward the front of the vehicle, and 3 toward the rear of the vehicle, irrespective of whether the seat is forward-facing or rearward-facing.

### Attachment requirements for sideways-facing seats

**2.8(16)** A sideways-facing seat that is retro-fitted to a low volume vehicle must meet the same attachment requirements as those specified for the corresponding stressed or unstressed forward-facing seats, in 2.8(9) to 2.8(13).

**NOTE:** 2.4(7) should be referred to for the limitations on the use of side-facing seats.

### Welding requirements

**2.8(17)** Any welding associated with the installation of a seat anchorage, or any reinforcement of any areas adjacent to a seat anchorage installation, **must:**

- (a) meet all welding requirements specified in 18.7 and 18.8 of *Chapter 18 Attachment Systems* of the *New Zealand Car Construction Manual*; and
- (b) follow time-proven best-practice methods, and incorporate good design and construction techniques.

**2.8(18)** A retro-fitted seat, seat mount, or any part of a seat mounting system, fitted to a low volume vehicle, with the exception of a vehicle which is primarily designed and used for LVVTA-recognised motor sport events, and for which a current and valid LVV Authority Card has been issued, must not be welded directly to the original structure of a production vehicle, unless:

- (a) the welding is carried out in accordance with written specifications approved by the vehicle manufacturer; and
- (b) the seat installation is designed and installed in such a way that it is durable, and resistant to the cyclic loading applied to the seat during the life of the vehicle, without damage or failure of the seat or the surrounding structure to which the seat is attached.

**NOTE 1:** An 'LVV Authority Card' as referred to in 2.8(18) is an authority card issued by Motorsport New Zealand or the New Zealand Hot Rod Association for authorised competition licence-holders.

**NOTE 2:** In contrast to a seatbelt anchorage, a seat anchorage will be subject to loading each time a seat is occupied, so the durability must be assured. Welded seat anchorages used in the past have had high failure rates from cracking of the floor-pan and consequently this design is not acceptable for normal road-going vehicles.

### Fastener requirements

**2.8(19)** A fastener used for the attachment of a retro-fitted seat in a low volume vehicle must be either:

- (a) supplied by the manufacturer of the seat being fitted, and fitted in accordance with the seat manufacturer's instructions or in a way that replicates the original seat installation; or
- (b) of a size and grade as required by 2.8(9) to 2.8(16) as applicable.

2.8(20)

A fastener used for the attachment of a retro-fitted seat in a low volume vehicle must:

- (a) be lightly coated with lubricant over the threaded section; and
- (b) have its tensile strength grade identified in order to establish the correct torque setting for the fastener [see table 2.8(19)]; and
- (c) be tightened to the applicable torque setting specified in table 2.8(19).

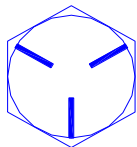
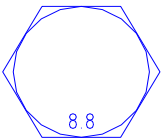
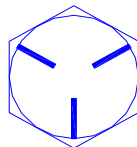
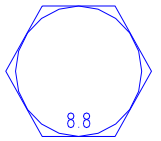
FASTENER GRADE	MARKING	SURFACE	TORQUE
5/16" Grade 5 imperial		un-plated	26 Nm (19 ft lb)
		plated	24 Nm (17.7 ft lb)
8 mm Grade 8.8 metric		un-plated	26 Nm (19 ft lb)
		plated	24 Nm (17.7 ft lb)
7/16" Grade 5 imperial		un-plated	51 Nm (37 ft lb)
		plated	48 Nm (35 ft lb)
12 mm Grade 8.8 metric		un-plated	89 Nm (65 ft lb)
		plated	83 Nm (61 ft lb)

Table 2.8(19) Fastener grade and torque settings

**Fastening through hollow sections**

2.8(21)

A retro-fitted seat anchorage fastener that is required to be positioned through a hollow section such as a sub-frame or cross-member in a low volume vehicle, must incorporate a crush-tube to enable correct tightening of the anchorage fastener without causing deformation of the section through which the anchorage fastener passes, that:



- (a) is constructed from a mild steel material, with a nominal wall thickness of 3 mm; and
- (b) is coated, together with the structure or surface to which the crush-tube attaches, with a permanent anti-corrosive protection such as paint or zinc plating; and
- (c) provides a metal-to-metal contact throughout the span of the seat anchorage fastener's attachment.

### Quick-release seat anchorage requirements

#### 2.8(22)

A retro-fitted seat may be fitted to a low volume vehicle that is able to be removed from and re-installed into the vehicle structure without the use of tools, provided that the seat anchorage system:

- (a) has been designed specifically for the purpose of attaching the configuration of seats being used; and
- (b) is either:
  - (i) confirmed as being appropriate for its application by *LVVTA Information Sheet #02-2006 Track-mount Seat Attachment Systems*; or
  - (ii) accompanied by documented evidence to substantiate compliance with the applicable loading requirements specified in 2.1;

and

- (c) is not be able to be either:
  - (i) removed without deliberate and specific effort; or
  - (ii) re-installed outside of the permitted area for lower seatbelt anchorages specified in 2.4 of *LVVTA Low Volume Vehicle Standard 175-00 (Seatbelt Anchorages)*;

and

- (d) is accompanied by clear instructions in the form of a label affixed in an appropriate position, for the correct removal and re-installation of the seat.

**NOTE:** Most quick-release type seat anchorage 'track' or 'rail' systems are designed only for the restraint of cargo and wheelchairs

## Sharing of seat and seatbelt anchorages

2.8(23)

A seat retro-fitted to a low volume vehicle may utilise a seatbelt anchorage as an attachment point for one corner of a seat.

## Other attachment requirements

2.8(24)

In the case of where it is not practicable to apply 2.8(2) to 2.8(21) due to the vehicle constructional features, the seat attachment system must meet the appropriate best practice solutions for special applications contained within *Chapter 14 Seats, Seatbelts and Anchorages of the New Zealand Hobby Car Technical Manual*.

## 2.9 Doubler plate and under-floor mounting plate requirements

2.9(1)

A seat retro-fitted to a low volume vehicle must, for all panel steel applications, be attached to the vehicle structure with either:

- (a) fasteners and doubler plate assemblies that meet the applicable requirements specified for fasteners and doubler plates in 2.9 of this standard; or
- (b) in the case of a seat leg assembly that attaches directly to the vehicle floor and covers a floor surface area of not less than 5000 square mm, with a width of not less than 40 mm, fasteners and under-floor mounting plates that meet the applicable requirements specified for fasteners and under-floor mounting plates within 2.9 of this standard.

**NOTE 1:** It is safe to use a single under-floor mounting plate instead of a doubler plate, provided that the seat frame area that is directly against the floor surface is big enough. In this case, the seat base effectively acts as the top plate in a doubler plate assembly.

**NOTE 2:** Mounting seatbelt anchorages to non-steel structures is possible, however any such installations should be dealt with by consulting LVVTA prior to commencement of work being undertaken.

**NOTE 3:** Panel steel refers to a thickness of up to 2.5 mm. Over 2.5 mm is referred to as chassis or structural steel and in this instance the *New Zealand Car Construction Manual* should be consulted for seat attachment requirements.

## Doubler plate specifications

2.9(2)

A doubler plate assembly used for the attachment of a retro-fitted seat to a low volume vehicle, must:

- (a) always consist of two plates, one on each side of the vehicle structure to which the seat is attached; and
- (b) have each plate constructed in one piece from mild steel, with a nominal plate thickness of 3 mm; and

- (c) have a hole within each plate to accommodate the seat attachment bolt, that:
  - (i) has a bolt clearance of not greater than 1 mm; and
  - (ii) is located as centrally as practicable on the plate surface;

and

- (d) incorporate on the plate on the opposite side of the vehicle structure to the seat, to accept a fastener specified in 2.8(19) and 2.8(20), a permanently fixed nut or threaded section of steel material having a minimum full thread depth of 5 mm (or four threads), of equal or greater size than either:
  - (i) 5/16 inch UNF imperial; or
  - (ii) 8 mm metric.

#### **Under-floor mounting plate specifications**

2.9(3)

An under-floor mounting plate used for the attachment of a retro-fitted seat to a low volume vehicle, must:

- (a) be positioned on the opposite side of the vehicle structure to which the seat is attached; and
- (b) be constructed from mild steel, with a nominal plate thickness of 3 mm; and
- (c) have a hole to accommodate the seat attachment bolt, that:
  - (i) has a bolt clearance of no greater than 1 mm; and
  - (ii) is located as centrally as practicable on the plate surface;

and

- (d) incorporate, to accept a fastener specified in 2.8(19) and 2.8(20), a permanently fixed nut or threaded section of steel material having a minimum full thread depth of 5 mm (or four threads), of equal or greater size than either:
  - (i) 5/16 inch UNF imperial; or
  - (ii) 8 mm metric.

**Doubler plate mating surface area**

2.9(4) A doubler plate assembly used in the retro-fitting of a seat to a low volume vehicle must be of a size and orientation that enables a minimum mating area to which both doubler plate surfaces contact, of 3000 square mm, with not less than 30 mm in width, which include those plate mating areas specified in *table 2.9(4)*.

80 mm x 50 mm
100 mm x 30 mm
100 mm x 40 mm
140 mm x 40 mm

**Table 2.9(4) Doubler plate mating surface area**

**NOTE 1:** Doubler plates that differ in size and positioning between top and bottom can assist in prevention of the panel-shearing effect that can occur when loaded. Note however, that the minimum specified plate mating surface area must still be maintained.

**NOTE 2:** The doubler plate thickness of 3mm allows some bending under load so that it can deform with the sheet steel of the body. Thicker plates would not deform and be more likely to pierce the sheet steel, leading to earlier failure.

**Under-floor mounting plate surface contact area**

2.9(5) An under-floor mounting plate used in the retro-fitting of a seat to a low volume vehicle must be of a size and orientation that enables either:

- (a) a minimum surface contact area of 3000 square mm, with not less than 30 mm in width, which include those mounting plate surface contact areas specified in *table 2.9(5)*; or
- (b) a minimum surface contact area required when used in conjunction with an over-floor mounting bar system, as specified in *2.10(4)(b)* and *(c)*.

80 mm x 50 mm
100 mm x 30 mm
100 mm x 40 mm
140 mm x 40 mm

**Table 2.9(5) Under-floor mounting plate surface contact area**

### Doubler plate and under-floor mounting plate preparation

2.9(6) A doubler plate or an under-floor mounting plate used in the retro-fitting of a seat to a low volume vehicle must:

- (a) have all corners rounded to a radius of no less than 5 mm; and
- (b) have all edges which contact the vehicle structure to which the doubler plate attaches rounded by the removal of no less than 0.1 mm; and
- (c) be coated, together with the structure or surface to which the doubler plate attaches, with a permanent anti-corrosive protection such as paint or zinc plating.

### Doubler plate attachment

2.9(7) A doubler plate assembly used in the retro-fitting of a seat to a low volume vehicle must be attached by a mechanical means to the vehicle structure by either:

- (a) two or more of a suitable type of structural rivets, positioned as closely as practical to parallel to the longitudinal centre-line of the vehicle, which:
  - (i) have a shank diameter of no less than 3.2 mm in diameter; and
  - (ii) are no less than 5 mm longer than the combined thickness of the materials through which the rivet passes;

or

- (b) two or more 5 mm bolts and nuts positioned as closely as practical to parallel to the longitudinal centre-line of the vehicle.

**NOTE:** Monel is a common brand of structural rivet, made from hard nickel-copper alloy. The rivet numbering system, for example '4-6 73MS' is as follows:

- 4-6 denotes a no.4 rivet diameter and no.6 rivet grip range. A 4-6 rivet has a diameter of 3.2 mm and a 6-6 rivet has a diameter of 4.8 mm.
- A 6-6 rivet has a (uncompressed) length of 14.9 mm, with a grip range of 7.9 mm-9.5 mm (the thickness of material that can effectively be gripped).
- 73 denotes the rivet head style, and MS denotes a nickel copper alloy rivet with a grade 400 zinc plated steel stem. The high nickel content provides corrosion resistance.

2.9(8) A doubler plate assembly used in the retro-fitting of a seat to a low volume vehicle must be attached in such a way as to:

- (a) be clamped as tightly as practicable; and

- (b) provide the maximum available clamping area over the required mating surface area, in no cases less than 3000 square mm; and
- (c) be aligned as closely as practical to parallel to the longitudinal centre-line of the vehicle.

#### **Under-floor mounting plate attachment**

2.9(9)

An under-floor mounting plate used in the retro-fitting of a seat to a low volume vehicle must be attached by a mechanical means to the vehicle structure, positioned as closely as practical to parallel to the longitudinal centre-line of the vehicle, either by:

- (a) two or more of a suitable type of structural rivets, positioned as closely as practical to the parallel to the longitudinal centre-line of the vehicle, which:
  - (i) have a shank diameter of not less than 3.2 mm in diameter; and
  - (ii) are no less than 5 mm longer than the combined thickness of the materials through which the rivet passes;

or

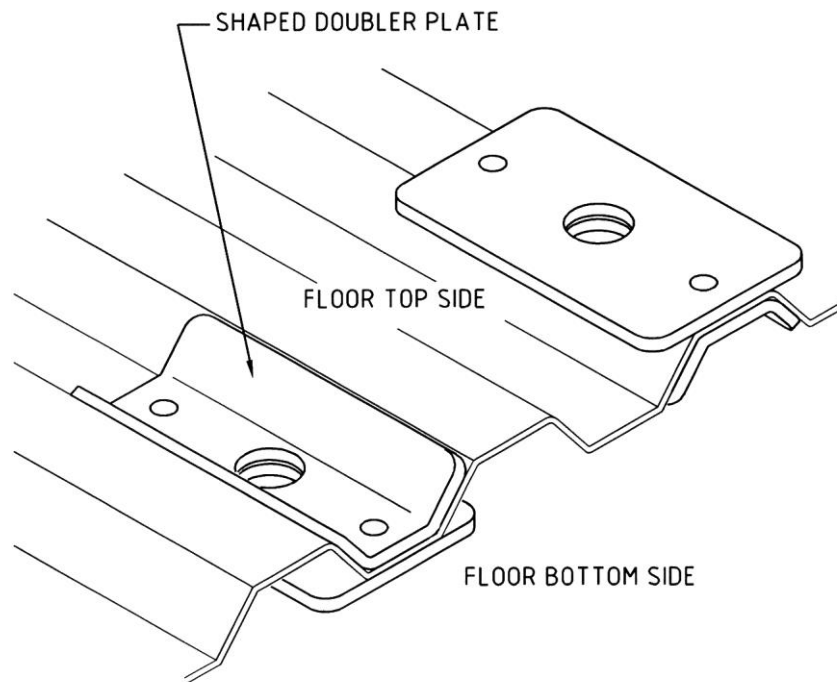
- (b) two or more 5 mm bolts and nuts positioned as closely as practical to parallel to the longitudinal centre-line of the vehicle

#### **Doubler plate and under-floor mounting plate attachment on uneven surfaces**

2.9(10)

Where a doubler plate assembly or an under-floor mounting plate is used to retro-fit a seat to a low volume vehicle, where there is an uneven surface such as a floor-pan with corrugations that does not have a false floor, the doubler plate assembly or under-floor mounting plate must maintain the required mating surface area, by either:

- (a) where the doubler plate assembly or under-floor mounting plate interferes with changes in the contour of the floor, be shaped to conform to the floor contour changes [see *diagram 2.9(10)(a)*]; or



**Diagram 2.9(10)(a): Doublers plates or under-floor mounting plates attached on uneven surfaces**

- (b) be supported by a packer that meets the requirements specified in 2.11(3) and 2.11(4), positioned between the floor surface and the doubler plate assembly or under-floor mounting plate; or
- (c) where there is a localised area of uneven surface, minimal panel-beating of the surface to achieve the required mating surface area.

**NOTE:** As further explanation to diagram 2.9(10)(a), the top plate on a 'peak' section, and a bottom plate on a 'valley' section, are not required to follow the shape of the floor surface, provided that the minimum contact areas are maintained.

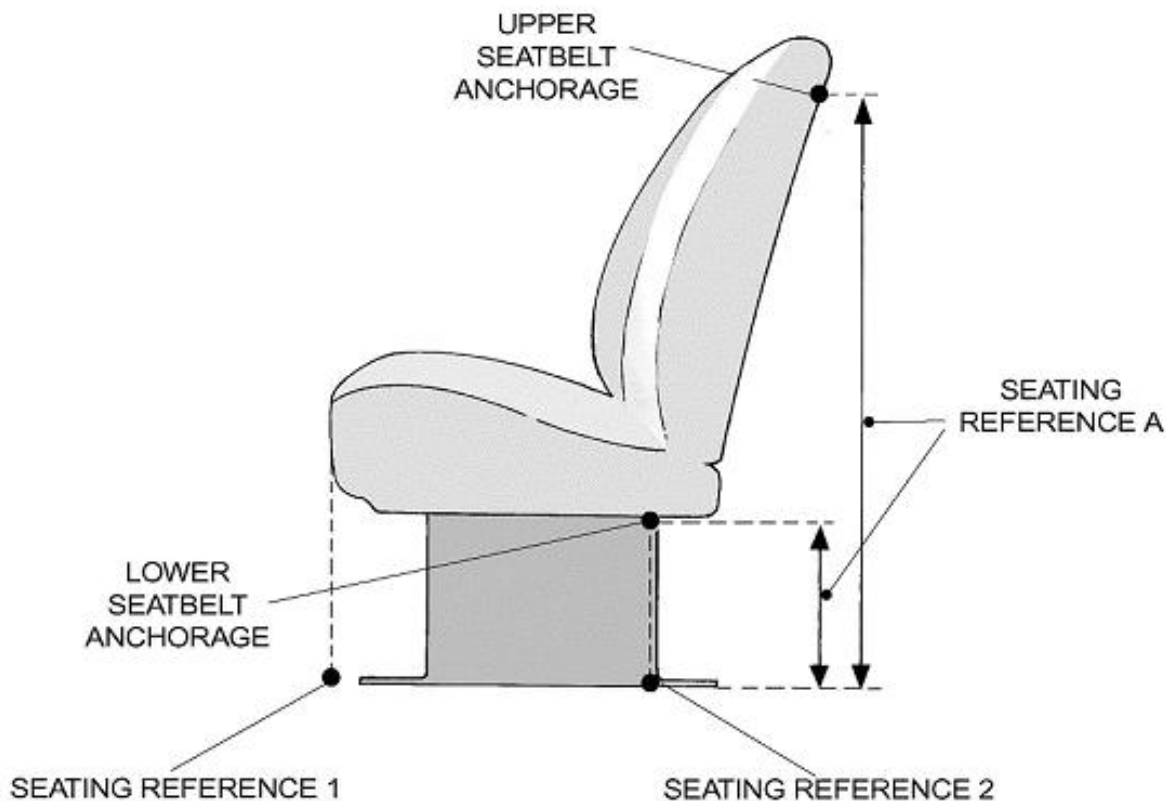
## 2.10 Stressed seat over-floor mounting bar systems

2.10(1) An over-floor mounting bar system must be attached to the vehicle structure in accordance with the requirements for over-floor mounting bar systems specified in 2.10(3) to 2.10(5).

### **Defining seat attachment reference points**

2.10(2) The seat attachment reference points for the purpose of applying 2.10(3) are: [see diagram 2.10(2)]

- (a) the point on the vehicle floor surface positioned directly below the forward-most part of the seat cushion, which is *seating reference 1*; and
- (b) the point on the vehicle floor surface positioned directly below the lower seatbelt anchorage, which is *seating reference 2*; and
- (c) the distance between the floor surface, and:
  - (i) in the case of a seat fitted with a lap-only seatbelt, the lower seatbelt anchorages, which is *seating reference A*; and
  - (ii) in the case of a seat fitted with a lap and diagonal seatbelt, the upper seatbelt anchorage, which is also *seating reference A*.



**Diagram 2.10(2): Over-floor mounting bar system reference points**

**NOTE:** In the case of a rear-facing seat fitted to an over-floor mounting bar system, the *seating reference points 1* and *2* should be switched, so that the 3 anchorages are to the rear of the vehicle compared to the seat. Due to the load by the occupants on the seat back, *seating reference A* should be measured from the top of the seat back, and not from the upper-most seatbelt anchorage point.



## Over-floor mounting bar system design and attachment

2.10(3)

An over-floor mounting bar system fitted to a low volume vehicle must be designed in such a way as to:

- (a) incorporate for each seat leg assembly, a mounting bar constructed from a mild steel material, that:
  - (i) has a nominal plate thickness of 12 mm; and
  - (ii) is of a width of not less than 50 mm; and
  - (iii) is positioned parallel to the longitudinal **centreline** of the seat; and
  - (iv) is prepared in accordance with the requirements specified for over-floor mounting bar preparation in 2.10(5);

and

- (b) attach to each seat leg assembly with **as many fasteners as the seat manufacturer requires, or three fasteners that meet the requirements specified for fasteners in 2.8(20); and are of equal or greater size and strength than either:**

- (i) **7/16 inch UNF grade-5 imperial; or**

- (ii) **12 mm grade-8.8 metric;**

and

- (c) attach to each seat leg assembly with **fasteners in the position required by the seat manufacturer, or three fasteners that are positioned:** [see *diagram 2.10(3)*]

- (i) one at the front of the seat, not more than 60 mm behind *seating reference 1*; and

- (ii) one not more than 60 mm forward of *seating reference 2*; and

- (iii) one not more than 60 mm behind *seating reference 2*;

and

- (d) attach directly to the vehicle floor with four fasteners that meet the requirements specified for fasteners in **2.8(20), and are of equal or greater size and strength than either:**

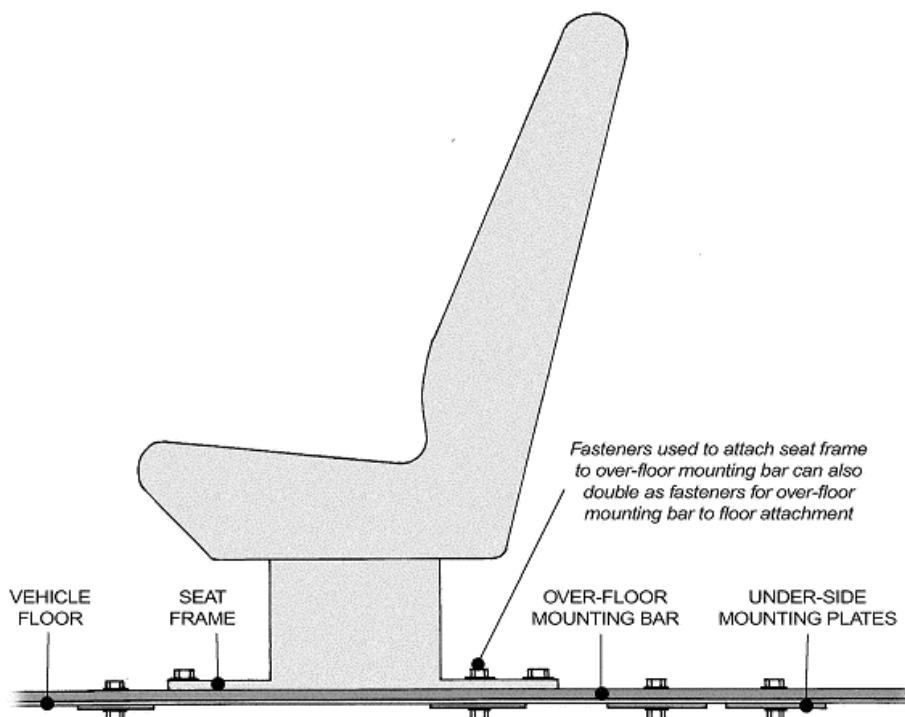
(i) 7/16 inch UNF grade-5 imperial; or

(ii) 12 mm grade-8.8 metric;

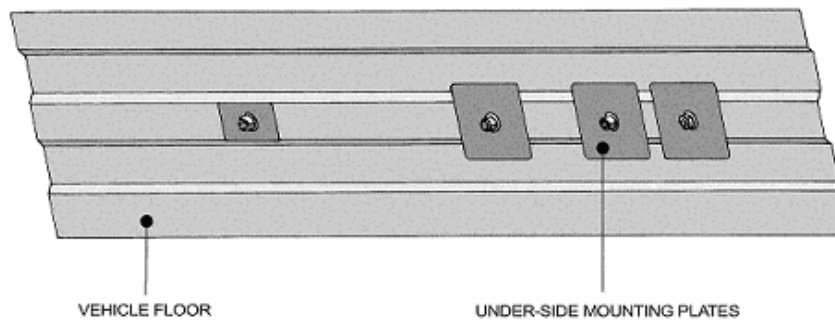
and

(e) attach directly to the vehicle floor with four fasteners that are positioned: [see diagram 2.10(3)]:

- (i) one at the front of the over-floor mounting bar, not more than 60 mm forward of *seating reference 1*; and
- (ii) one not more than 60 mm forward of *seating reference 2*; and
- (iii) one behind the seat at 25% of *seating reference A*, measured from *seating reference 2*; and
- (iv) one behind the seat at 50% of *seating reference A*, measured from *seating reference 2*.



**Diagram 2.10(3): Over-floor mounting bar system attachment (a)**



**Diagram 2.10(3): Over-floor mounting bar system attachment (b)**

**NOTE:** In the case of a rearward-facing stressed seat, the over-floor mounting system must be positioned in reverse (in relation to the seat) to that shown in *Diagram 2.10(3)*, so that the 3 mounting plate fasteners in the diagram that are behind the seat back, are, in the case of a rearward-facing seat, in front of the seat back. Put more simply, a seat using an over-floor mounting system, must always have one fastener toward the front of the vehicle, and 3 toward the rear of the vehicle, irrespective of whether the seat is forward-facing or rearward-facing.

2.10(4) An over-floor mounting bar system fitted to a low volume vehicle must be assembled in such a way as to:

(a) attach each seat leg to the over-floor mounting bar, by incorporating within the over-floor mounting bar to accept the fasteners specified in 2.10(3)(b), holes where through-bolting can occur, or where this cannot be achieved due to the vehicle structure, a correctly formed threaded section for each fastener, having a full thread depth of not less than 8 mm (or six threads), of equal or greater size than either:

(i) 7/16 inch imperial; or

(ii) 12 mm metric;

and

(b) in the case of a stressed seat fitted with lap-only seatbelts, attach each over-floor mounting bar to the vehicle floor, by incorporating for each fastener specified in 2.10(3)(d), an under-floor mounting plate that: [see *diagram 2.10(3)*]

(i) is as close as practicable to 100 mm x 100 mm; and

(ii) meets the applicable requirements specified for under-floor mounting plates in 2.9;

and

- (c) in the case of a stressed seat fitted with lap and diagonal seatbelts, attach each over-floor mounting bar to the vehicle floor, by incorporating for each fastener specified in 2.10(3)(d), an under-floor mounting plate that: [see diagram 2.10(3)]
- (i) is as close as practicable to 100 mm x 150 mm, arranged with the longest side of the plate parallel to the longitudinal centreline of the vehicle; and
- (ii) meets the applicable requirements specified for under-floor mounting plates in 2.9.

- NOTE 1: The ability to attach the seat frame to the over-floor mounting bar by drilling and tapping is only due to the difficulties associated with through-bolting presented by cross-members positioned beneath the seat attachment points. Wherever possible, through-bolting should be carried out instead of drilling and tapping.
- NOTE 2: The integrity of an over-floor mounting bar system that is not fully through-bolted relies on the quality of the thread-forming achieved during the drilling and tapping procedures of the over-floor mounting bar. A thorough visual inspection must be undertaken by the low volume vehicle certifier, prior to final fastener installation, to ensure that top quality thread forms have been achieved within the bar.
- NOTE 3: The material thickness of 12 mm specified in 2.10(3)(a)(i) for an over-floor mounting bar is deemed necessary on the basis that there will always be situations where one or more of the specified attachment points cannot be accessed from the underside due to the presence of cross-members and other objects, and will therefore drilling and tapping of the bar will be necessary. In the unlikely event of all specified attachment points being accessible and drilling and tapping becomes unnecessary, the bar could be made from 3 mm material.
- NOTE 4: Where the vehicle structure allows it, the fasteners used to attach the seat frame to the over-floor mounting bar can also be used to attach the over-floor mounting bar to the floor structure.
- NOTE 5: Wherever possible, the under-floor plates that clamp the over-floor mounting bar to the vehicle floor should form a continuous strip of material, as one or two longer plate sections will distribute a load better than three or four individual plates.
- NOTE 6: In the case of an over-floor mounting bar used in conjunction with a false floor, the affected area of the false floor must be removed to enable the over-floor mounting bar to sit directly on the vehicle floor.

### Over-floor mounting bar preparation

- 2.10(5) An over-floor mounting bar used to retro-fit a stressed seat to a low volume vehicle must:
- (a) have all corners rounded to a radius of not less than 5 mm; and
- (b) have all edges which contact the vehicle structure to which the over-floor mounting bar attaches rounded by the removal of no less than 1 mm; and

- (c) be coated, together with the structure or surface to which the over-floor mounting bar attaches, with a permanent anti-corrosive protection such as paint or zinc plating.

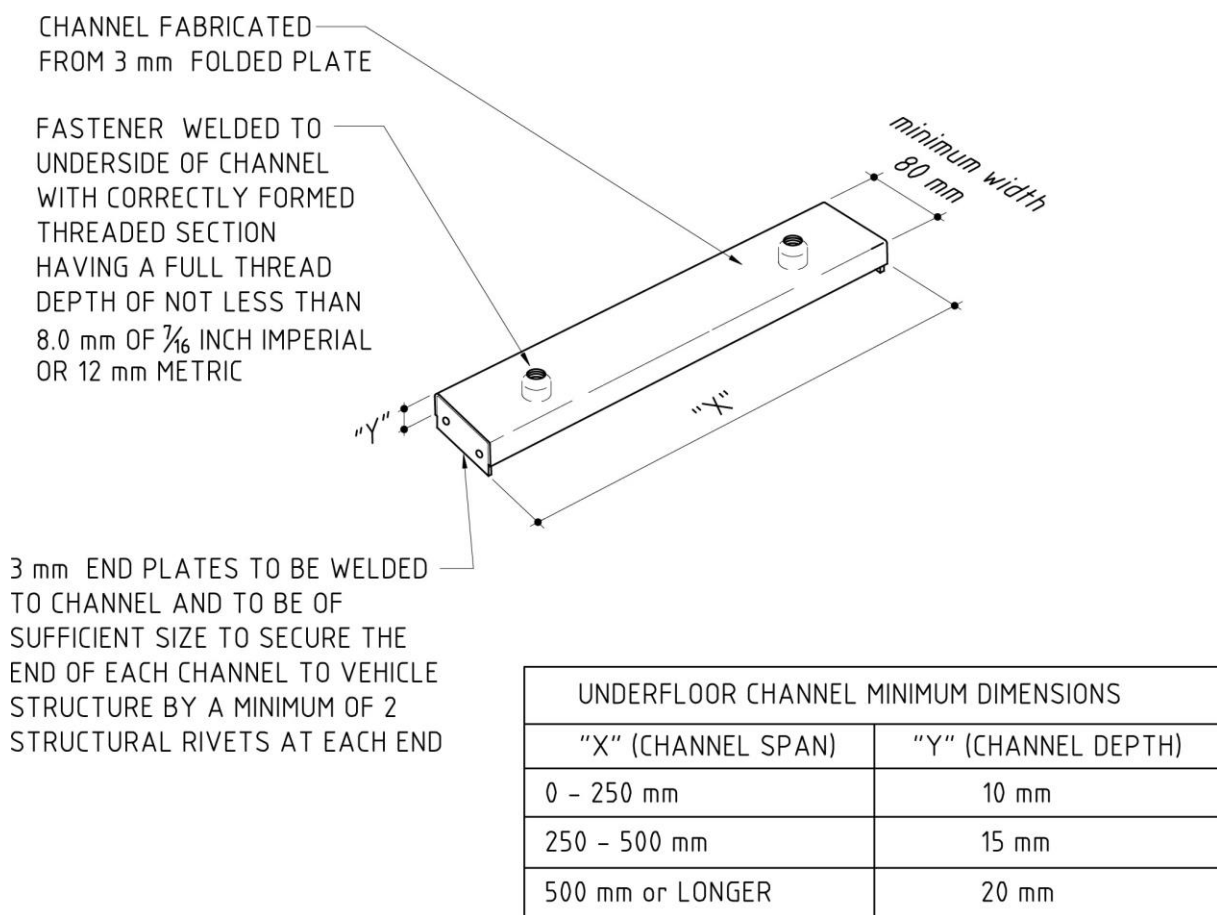
## 2.11 Underfloor channel system requirements

2.11(1) An underfloor channel seat mounting system, must be attached to the vehicle structure in accordance with the requirements specified for channel systems within 2.11 of this standard.

### Channel system design

2.11(2) A channel system fitted to a low volume vehicle must be designed so that the under-floor channel as shown in *diagram 2.11(2)*:

- (a) has a minimum width of 80mm; and
- (b) incorporates folded-up sides of a minimum depth of:
- (i) 10 mm for channels up to 250 mm in length; or
  - (i) 15 mm for channels between 250 mm and 500 mm in length; or
  - (ii) 20 mm for channels over 500 mm in length;
- and
- (c) has a nominal thickness of 3 mm; and
- (d) incorporates end plates large enough to secure each end of each channel section to the vehicle by a minimum of two structural rivets with a shank diameter of 4.8 mm, or 2 mechanical fasteners of equal or greater strength; and
- (e) incorporates within the channel section a fastener for the attachment of the seat, attached by welding, with a correctly-formed threaded section, having a full thread-depth of not less than 8 mm (or 6 threads) of equal or greater size than either:
- (i) 7/16 inch imperial; or
  - (ii) 12 mm metric.



**Diagram 2.11(2) Under-floor channel**

**Channel system attachment**

**2.11(3)**

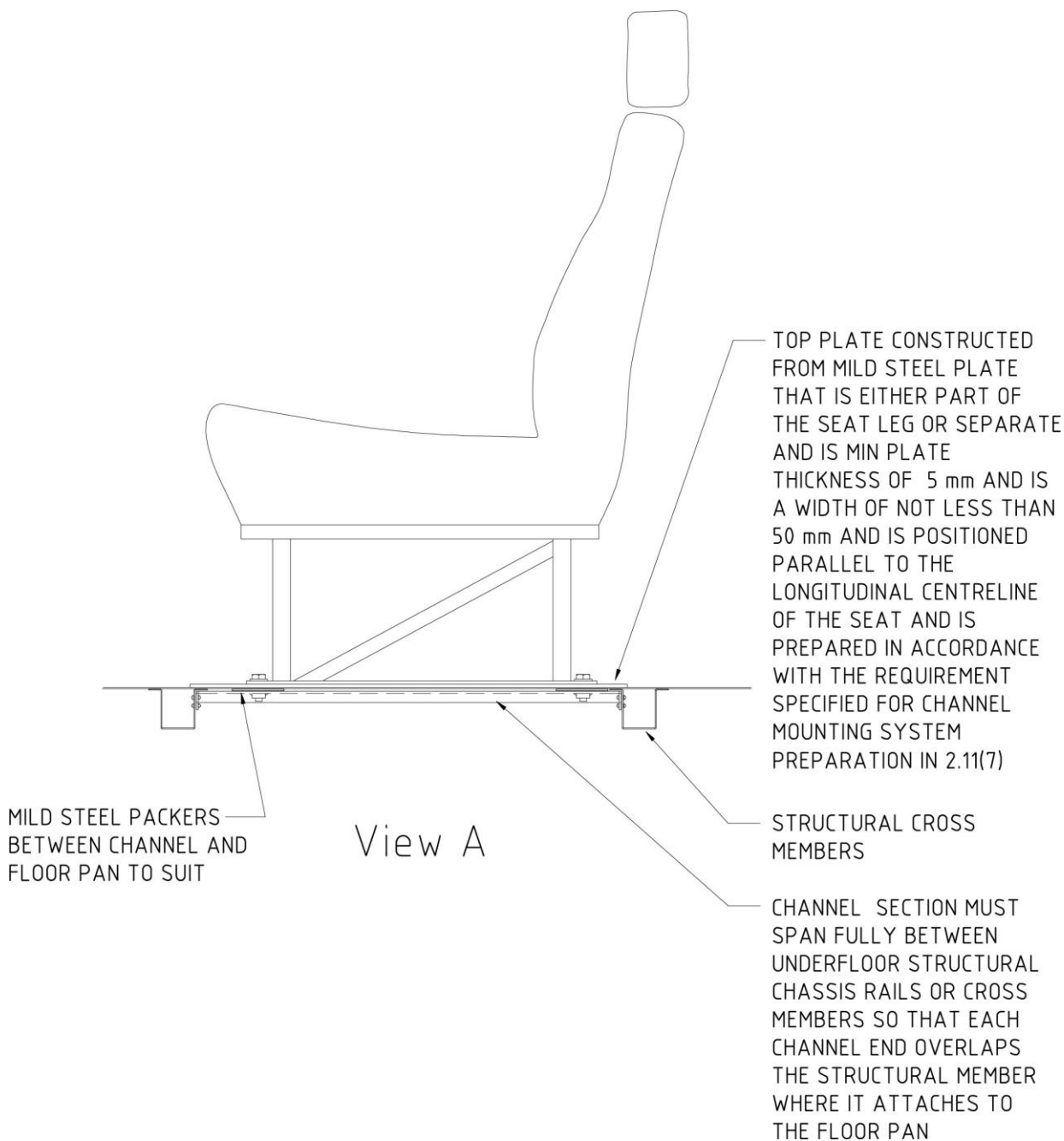
A channel system fitted to a low volume vehicle must be assembled in such a way as to:

- (a) span each channel-section fully between two underfloor structural chassis rails or cross-members, so that each channel-section end overlaps the structural member where it attaches to the floor-pan, as shown in *diagram 2.11(3)(a), (b), and (c)*; and
- (b) affix each channel-section to the structural members by a minimum of two structural rivets; and
- (c) incorporate for each seat leg assembly, a top-plate constructed from a mild steel material, that:
  - (i) is either part of the seat leg, or a separate component; and

- (ii) has a nominal plate thickness of 5 mm; and
- (iii) is of a width of not less than 50 mm; and
- (iv) is positioned parallel to the longitudinal centreline of the seat; and
- (v) is prepared in accordance with the requirements specified for channel mounting system preparation in 2.11(6).



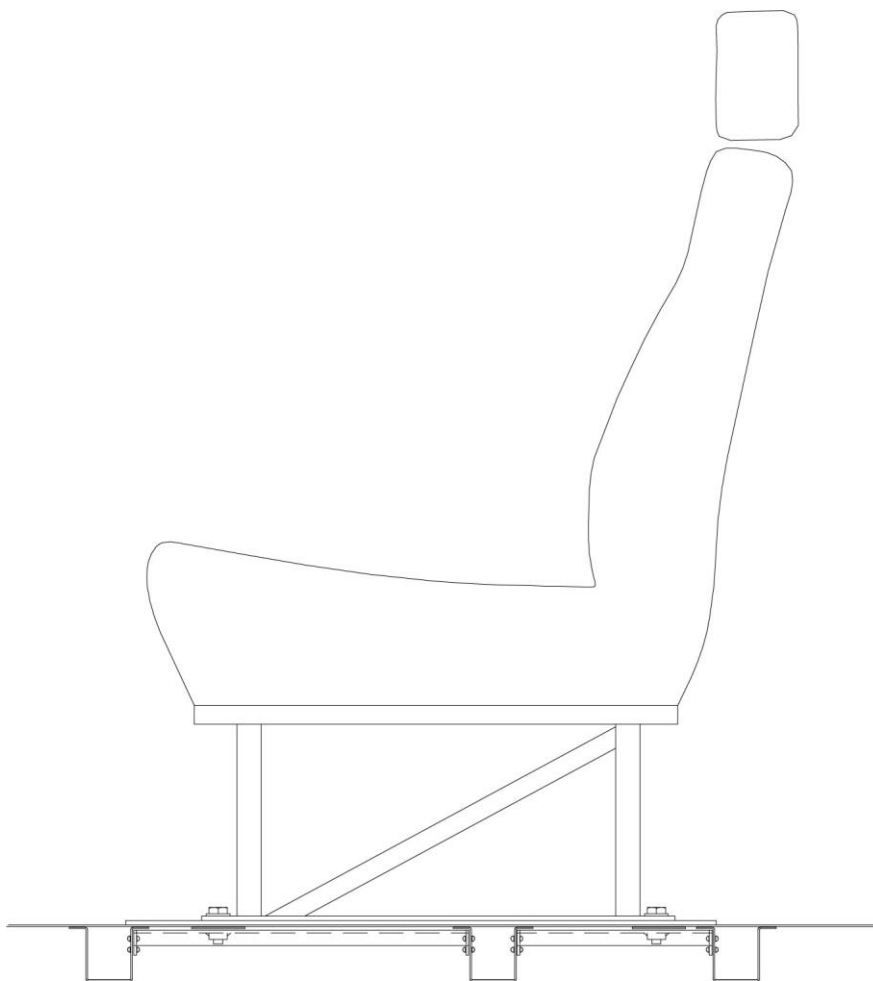
**Diagram 2.11(3)(a) Channel spans between structural cross-members**



**Diagram 2.11(3)(b) Channel spans between structural cross-members**

**NOTE:** In order to reduce the likelihood of the seat piercing through the floor-pan in the event of an accident, the under-floor channels and over-floor plates must overlap the structural members so that any upward or downward force is distributed into the structure and not just into the floor-pan.





View A

(ALTERNATIVE CHANNEL SECTION  
ARRANGEMENT THAT MAY BE REQUIRED  
DUE TO CROSS MEMBER LOCATIONS)

**Diagram 2.11(3)(c) Channel spans between structural cross-members**

**Seat attachment to channel system**

2.11(4)

A seat fitted to a channel system must be attached in such a way that either:

- (a) the seat is attached to the vehicle structure so as to meet the applicable loading requirements specified in 2.1, and installed using all necessary installation hardware, including plates and fasteners provided or specified by the manufacturer of the seat, to enable correct attachment of the seat to the vehicle; or

(b) each seat leg attaches to an underfloor channel, by at least two fasteners of equal or greater size and strength than either:

(i) 7/16 inch imperial; or

(ii) 12 mm metric.

2.11(5) A seat anchorage must incorporate packers where necessary to provide a contact area of at least 3000 square mm around a seat fastener.

### **Channel mounting system preparation**

2.11(6) A channel system used to retro-fit a stressed seat to a low volume vehicle must:

(a) have all corners rounded to a radius of not less than 5 mm; and

(b) have all edges which contact the vehicle structure to which the channel attaches rounded by the removal of no less than 1 mm; and

(c) be coated, together with the structure or surface to which the channel attaches, with a permanent anti-corrosive protection such as paint or zinc plating.

## **2.12 False floor requirements**

2.12(1) A seat retro-fitted to a low volume vehicle that incorporates a false floor, must meet the applicable false floor requirements specified within 2.12 of this standard.

### **Methods of seat attachment to false floors**

2.12(2) A retro-fitted seat must not be attached directly to a compressible false floor in a low volume vehicle without the use of either:

(a) a solid packer that meets the requirements specified in 2.12(3) and 2.12(4), used in conjunction with an under-side mounting plate, positioned between the floor and the seat [see diagram 2.12(2)(a)]; or

(b) a tubular spacer that meets the requirements specified in 2.12(7), used in conjunction with a doubler plate assembly [see diagram 2.12(2)(b)]; or

(c) in the case of a false floor positioned above a corrugation within the original floor section, a combination of a solid packer that meets the requirements specified in 2.12(3) and 2.12(4), positioned beneath a tubular spacer that meets the requirements specified in 2.12(7), used in conjunction with an under-side mounting plate [see diagram 2.12(2)(c)].

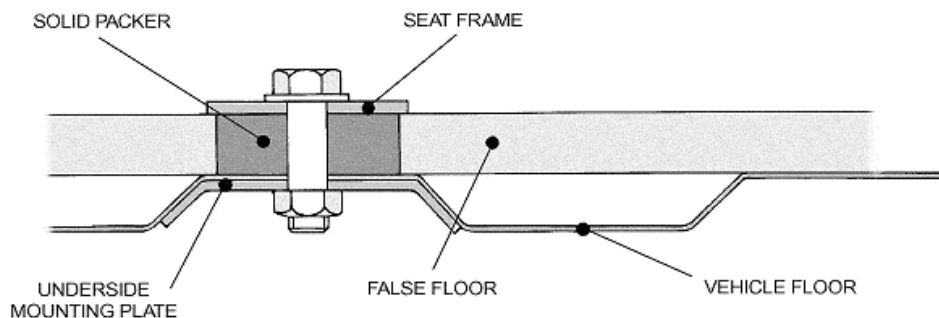


Diagram 2.12(2)(a) Solid packers with false floors

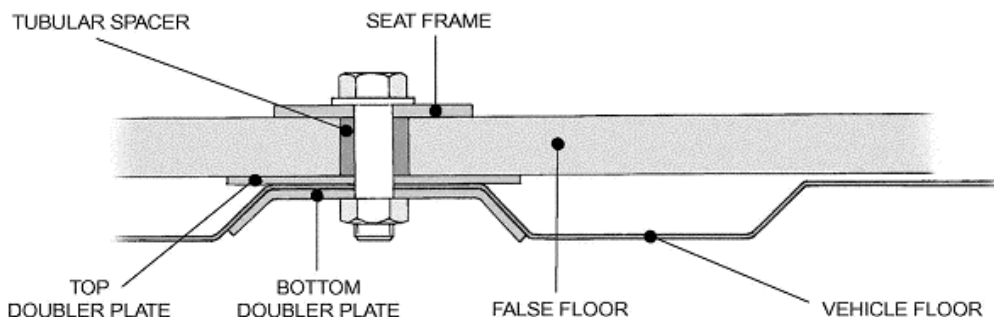


Diagram 2.12(2)(b) Tubular spacers with false floors

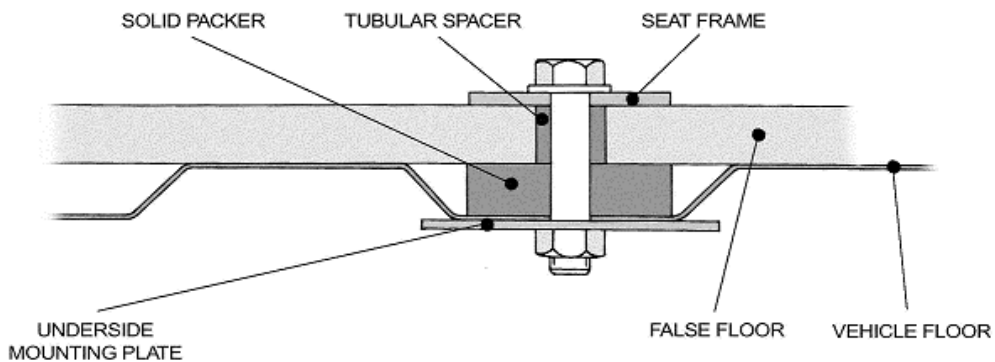


Diagram 2.12(2)(c) Solid packers and tubular spacers with false floors

**2.12(3)**

A solid packer used in the retro-fitting of a seat to a low volume vehicle must not be positioned:

- (a) on the underside of any floor surface to which a seat is attached; or
- (b) in the case of a stressed forward-facing seat, or a stressed or unstressed rearward-facing seat, on the top side of the floor at the front attachment points.

**NOTE:** The requirements contained in 2.12(3) are there to prevent a shearing action occurring from the solid packer against the floor surface, as a result of the direction of force being applied through the packer to the floor.

**Solid packer specifications****2.12(4)**

A solid packer may be used to position a retro-fitted seat over a compressible false floor in a low volume vehicle, provided that the solid packer:

- (a) is constructed from mild steel or aluminium; and
- (b) is of a thickness that is the same as the false floor; and
- (c) has a minimum surface contact area of 3000 square mm; and
- (d) is configured as closely to square as practicable; and
- (e) has a central hole that is the correct size for the seat anchorage bolt, that is located as centrally as possible; and
- (f) is prepared as specified in 2.12(5) and 2.12(6).

**Solid packer preparation****2.12(5)**

A solid packer used in the retro-fitting of a seat to a low volume vehicle must:

- (a) have all corners rounded to a radius of not less than 3 mm; and
- (b) have all edges, which contact the vehicle structure to which the solid packer attaches, rounded to a radius of not less than 3 mm.

**2.12(6)**

Where a solid packer is used in the retro-fitting of a seat to a low volume vehicle, a permanent anti-corrosive protection, such as paint or zinc plating, must be applied to:

- (a) a solid packer that is constructed from a mild steel material; and

- (b) the structure or surface to which the solid packer attaches.

### **Tubular spacer specifications**

#### **2.12(7)**

A tubular spacer may be used to position a seat over a compressible false floor, provided that the tubular spacer:

- (a) has a central hole that is the correct size for the seat attachment bolts; and
- (b) is positioned on top of either:
  - (i) a doubler plate assembly that meets the applicable requirements specified for doubler plates in 2.9; or
  - (ii) or a packer that meets the applicable requirements specified for packers in **2.12**;

and

- (c) has a nominal thickness of not less than 4 mm in wall thickness; and
- (d) is not more than 13 mm in length; and
- (e) has any edges rounded by not less than 1 mm.

## **2.13**

### **Other requirements**

#### **Vehicle payload restriction**

#### **2.13(1)**

Where seating positions additional to those provided by the vehicle manufacturer are retro-fitted, the total load of 80 kg per seating position, plus the weight of the additional seats, seatbelts, and attachment systems, must not exceed the manufacturer's design payload.

NOTE: The payload referred to in **2.13(1)** is the difference between the tare of the vehicle, and the gross vehicle mass specified by the manufacturer. Where a LVV certifier suspects that the payload of the vehicle has been exceeded, he should require the vehicle to be weighed.

#### **Spare wheel relocation**

#### **2.13(2)**

Where a retro-fitted seat is installed in such a position as to necessitate the relocation of the spare wheel assembly, the spare wheel assembly must be mounted using an attachment system suitable for the weight and orientation of that wheel assembly.

NOTE: A typical wheel and tyre assembly weighing, say, 15 kg, when subjected to the inertia of a 20G collision, effectively assumes a weight of 300 kg, therefore an attachment system must be designed to be capable of holding 300 kg rather than 15 kg.

### Other standards and rules required to be met

2.13(3) A low volume vehicle certified to this standard must also meet the requirements specified in *LVVTA Low Volume Vehicle Standard 155-40 (Interior Impact)* in relation to any retro-fitted seat and head restraint.

2.13(4) Each seat fitted to a low volume vehicle certified to this standard that is required to be provided with seatbelts, must be fitted with:

- (a) seatbelts that meet the requirements specified in *Land Transport Rule 32011: Seatbelts and Seatbelt Anchorages 2002*; and
- (b) seatbelt anchorages that meet the requirements specified in *Low Volume Vehicle Standard 175-00 (Seatbelt Anchorages)*.

## Section 3 Exclusions to this standard

### 3.1 Disability seat travel exclusion

3.1(1) A low volume vehicle that is modified for a person with a disability, who requires an unusual amount of longitudinal adjustment travel to facilitate transfer from a wheelchair to the driver's seat, is not required to comply with 2.3(3).

### 3.2 Disability swing-out seat exclusion

3.2(1) A swing-out seat, that is used for the transfer of a disabled or elderly person from the outside of the vehicle to a seated position within the vehicle, is not required to comply with 2.1, or 2.3 to 2.13 inclusive, provided that:

- (a) the mounting of the swing-out seat unit to the vehicle structure can be proven, through documented evidence, to be able to withstand 20 times the combined weight of the seat unit and seat, applied through the centre of gravity of the seat unit, together with any loads applied through any seatbelt anchorage fitted to the seat; and
- (b) metal to metal contact is maintained between the swing-out seat unit mounting points, the vehicle structure, and the under-floor mounting plates; and

- (c) the swing-out seat meets the requirements specified in *LVVTA Low Volume Vehicle Standard 45-60 (Disability Transportation Systems)* in relation to a personal transfer device.

### 3.3 Original equipment exclusion

3.3(1) A forward-facing unstressed seat that is fitted to a low volume vehicle designed and constructed, or modified, for motor sporting or recreational activities, is not required to meet the requirements specified in 2.5 provided that either:

- (a) the seat back is supported by the rear bulkhead structure of the vehicle; or
- (b) the seat is sourced from a vehicle manufactured during an era appropriate to the age and style of the vehicle being modified or replicated.

### 3.4 Motor-sporting exclusion

3.4(1) A low volume vehicle designed and constructed primarily for motor sporting events is not required to comply with the fixed seat cushioning requirement in 2.4(3)(a).

### 3.5 LVVTA-approved authority card exclusions

3.5(1) A low volume vehicle, for which a valid *Low Volume Vehicle Authority Card* that specifies 'Competition Seat' is issued by an LVVTA-approved organization, is not required to comply with section 2 of this standard.

3.5(2) A low volume vehicle, for which a valid *Low Volume Vehicle Authority Card* that specifies 'Roll Protection structure' or 'Safety Structure' is issued by an LVVTA-approved organisation, is not required to comply with 2.8(18) of this standard.

NOTE 1: A low volume vehicle authority card is only available for a vehicle that is modified for a particular purpose, in order to meet the specific needs of the person nominated on the authority card. An example of this is a vehicle that is modified to meet motor-sporting regulations.

NOTE 2: The operator of a vehicle for which a LVVTA-approved authority card is issued, must, when requested by an enforcement officer or certifier, produce the authority card for that vehicle.

### 3.6 Passenger Service Vehicle exclusion

3.6(1) A seat retro-fitted to a low volume vehicle must meet the applicable positioning requirements specified within 2.3 of this standard, except where the vehicle is a Passenger Service Vehicle, in which case the requirements in *Land Transport Rule 31001 (Passenger Service Vehicles)* take precedence over any conflicting requirements found in this standard.

### **3.7** Motorhome seat frame exclusion

- 3.7(1)** A motorhome seat constructed from a steel frame and fitted with a lap belt, or an approved motorhome seatbelt frame that has a steel seat frame added, is not required to have calculations or a test report as usually required for a stressed seat, provided that the construction meets the design detailed in *LVVTA Information Sheet #03-2012 (Motorhome Seats - General Information)*.

### **3.8** Nissan seat anchorage exclusion

- 3.8(1)** A Nissan Terrano or Mistral that has undergone modifications to the rear seat anchorages as part of a corrosion repair is not required to meet the requirements for seat anchorages in this standard, provided that the repairs are carried out in accordance with the design detailed in *LVVTA Information Sheets # 02-2005 (Nissan Mistral Rear Seatbelt Anchorage/Floor Rust Problem)* or *# 03-2004 (Nissan Terrano D21 Rear Seatbelt Anchorage/Floor Rust Problem)*.

## **Section 4** Vehicles not required to be certified to this standard

### **4.1** Vehicles not covered by this standard

- 4.1(1)** A light vehicle is not required to be certified to this low volume vehicle standard, if the vehicle is modified for the purposes of law enforcement or the provision of emergency services.
- 4.1(2)** A light vehicle is not required to be certified to this low volume vehicle standard, if the vehicle is identified as having been modified by a second-stage vehicle manufacturer, and complies with an approved overseas standard that is listed in *Annex 6 of the Low Volume Vehicle Code*.

### **4.2** Vehicles that pre-date legal requirements

- 4.2(1)** A light vehicle is not required to be certified to this standard, if, before 1 October 2004, the vehicle:
- (a) was retro-fitted with additional seats; or
  - (b) had existing seats relocated or modified; or
  - (c) was modified in such a way that any seats or seat anchorages may, directly or indirectly, be affected; or
  - (d) was scratch-built.



**4.3 Modifications that do not require certification**

4.3(1) A vehicle is not required to be certified to the *Low Volume Vehicle Code*, provided that the safe operation of the vehicle is not compromised, where the only modifications to the vehicle are any one or more of the following items:

(i) the retrofitting of a seat, provided that the seat is either an unmodified OE seat for the vehicle, or of a known and reputable aftermarket brand;

(ii) modified OE seat anchorages;

(iii) a process and are not fitted

(iv) the relationship between seat, seatbelt and seatbelt anchorages is not affected;

or

(b) the retrofitting of a 'Retro'-brand child seat, provided that the seat is identified as complying with the Australian Federal Code of Practice VSB-5A (category 2 and 3) and was installed by Auckland Auto Trimmers or their agents before 1 June 2012.

**Section 5 Terms and definitions within this standard**

- Child** means, for the purpose of establishing seat dimensions, a person up to and including 14 years of age.
- Crush-tubes** means a section of non-compressible material that is positioned within a cavity through which fasteners are fitted, to prevent collapsing of the material surrounding the cavity, and consequential loosening of the fasteners.
- Doubler plates** means plates that are positioned on each side of a surface to which a component or fitting is attached, to spread the load of the fastener over a larger area than that of the fastener itself.

**UPDATE**

Due to recent updates to the NZTA VIRM Threshold please visit [https://www.lvvta.org.nz/documents/supplementary\\_information/LVVTA\\_LVV\\_Cert\\_Threshold.pdf](https://www.lvvta.org.nz/documents/supplementary_information/LVVTA_LVV_Cert_Threshold.pdf) to confirm which modifications do not require LVV Certification

<b>Energy-absorbing material</b>	means a deformable high-density material that provides impact protection to vehicle occupants by absorbing energy, and preventing direct contact with any solid surfaces or objects positioned beneath the material in the event of contact. (Energy-absorbing material should not be able to be compressed by more than 30% under firm thumb pressure)
<b>Forward-facing</b>	refers to a seat that is mounted so that the occupant faces forward in the vehicle (within +/- 10%), in the direction of forward travel.
<b>Kg</b>	is an abbreviation for a kilogram.
<b>kN</b>	is an abbreviation for a kilo-Newton, which is equal to 1000 Newtons.
<b>Lap seatbelt</b>	means a seatbelt that passes solely across the front of the wearer's pelvic region.
<b>Lap-and-diagonal seatbelt</b>	means a seatbelt comprising a lap strap that passes across the front of the wearer's pelvic region, and a diagonal strap that passes across the front of the wearer's torso from one side of the pelvic region to the shoulder on the opposite side.
<b>LVVTA Body frame</b>	means a frame designed and manufactured by the Low Volume Vehicle Technical Association Incorporated to identify certain critical measurements and positions for safety-related components and systems.
<b>Motor caravan</b>	means a motor vehicle that is designed and operated for the purpose of enabling its passengers to both travel and sleep within the vehicle, and incorporates both sleeping and cooking facilities.
<b>Multiple sensitive emergency locking retractor</b>	means a retractor that, during normal driving conditions, allows freedom of movement by the wearer of the seatbelt by means of length-adjusting components that automatically adjust the strap to the wearer, and that comprises two or more of the locking mechanisms specified for single-sensitive emergency-locking retractors.
<b>N</b>	means an abbreviation for a newton, which is the amount of force required to accelerate a 1 kilogram mass by 1 metre per second per second.
<b>Nominal wall thickness</b>	means a thickness that is generally the declared size within commonly accepted tolerances, but can vary in some areas due to distortion from the manufacturing process.
<b>Nm</b>	means an abbreviation for Newton-metres, which is equal to a torque of 1 N applied over a one-metre long lever.
<b>Outer seating position</b>	means a seating position next to a side wall where there is no more than 500 mm between the longitudinal centre of the seat and the side wall of the vehicle.

<b>Over-floor</b>	means, in relation to the over-floor mounting bar system specified in this standard, positioned on the top-side of the vehicle floor surface.
<b>Packer</b>	means a section of non-compressible material through which a fastener passes, that is positioned where a crushable material exists between a component and a solid part of the vehicle, to prevent collapsing of the crushable material, and consequential loosening of the fastener.
<b>Permanent structure</b>	means a non-removable structure capable of sustaining loads associated with seat anchorages.
<b>Pillar</b>	means the part of a vehicle structure which is positioned substantially vertically extending from the floor to support the upper body or roof structure.
<b>Plug-weld</b>	means a circumferential welding technique used to join two adjacent sections of material to each other, by welding around a hole drilled in the top section of material into the section positioned underneath.
<b>Rearward-facing</b>	refers to a seat that is mounted so that the occupant faces to the rear in the vehicle (within +/- 10%), opposite to the direction of forward travel.
<b>Retractor</b>	means a device to accommodate parts, or all, of the webbing of a seatbelt.
<b>Retro-fitted</b>	in relation to a seat or seat anchorage in a motor vehicle, means to fit a seat or seat anchorage in place of an existing seat or seat anchorage, or in a location where a seat or seat anchorage has not been fitted before.
<b>Roll-over protection</b>	means a structure designed to provide protection for the vehicle occupants in the event of a roll-over collision.
<b>Seat</b>	means an assembly including the frame, rails, runners and brackets, or part of an assembly, intended to seat at least one person, that may or may not be integral to the vehicle structure.
<b>Seatbelt</b>	means an arrangement of straps with a securing buckle, adjusting devices and attachments that is capable of being anchored to the interior of a vehicle and is designed to diminish the risk of injury to its wearer in the event of a collision or abrupt deceleration of the vehicle by limiting the mobility of the wearer's body; and includes any device for absorbing energy or for retracting the webbing.
<b>Seat anchorage</b>	means the parts of the vehicle structure to which a seat is attached.
<b>Side-facing</b>	refers to a seat that is mounted so that the occupant faces sideways in the vehicle (within +/- 10%), perpendicular to the direction of forward travel.

**Semi-stressed seat** refer to 'stressed seat'.

**Seating position** means a seat or part of a seat that is of a suitable size and shape for one person.

**Side-wall** means the section on the inside of a motor vehicle positioned vertically between the floor surface and the roof section.

**Single-sensitive emergency locking retractor** means a seatbelt retractor that, during normal driving conditions, does not restrict the freedom of movement by the seatbelt wearer by means of length adjusting components that automatically adjust the seatbelt to the wearer, and that comprises a locking mechanism actuated in an emergency by either:

- (a) deceleration of the vehicle; or
- (b) extraction of the strap from the retractor; or
- (c) other means.

**Stressed seat** means a seat that has one or more seatbelt anchorages attached to the seat frame in such a way that any loading applied to the seatbelt anchorages would be transmitted through the seat structure to the seat anchorage. A 'semi-stressed' seat refers to a seat with anchorages only for the lap part of a belt, not the upper anchorage.

**Structural rivet** means a specific type of blind or pop rivet made from alloy-based materials suitable for the attachment of doubler plates to motor vehicle structures. A structural rivet is a rivet that has a greater strength for use in structural applications.

**Tare** means the unladen weight of a vehicle.

**Under-floor** means, in relation to the under-floor mounting plates specified in this standard, positioned on the underside of the vehicle floor surface.

**Unstressed seat** means a seat that does not have any seatbelt anchorages incorporated directly within the seat frame.

**Waist rail** means the strengthening section on the inside of a motor vehicle positioned horizontally immediately below the side windows, and includes the same strengthening section below an area where no window is present, but could be fitted.

**Webbing clamp** means a device forming part of a seatbelt that locks the seatbelt webbing outside the retractor for the purpose of reducing the forward movement of the seatbelt wearer.

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

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