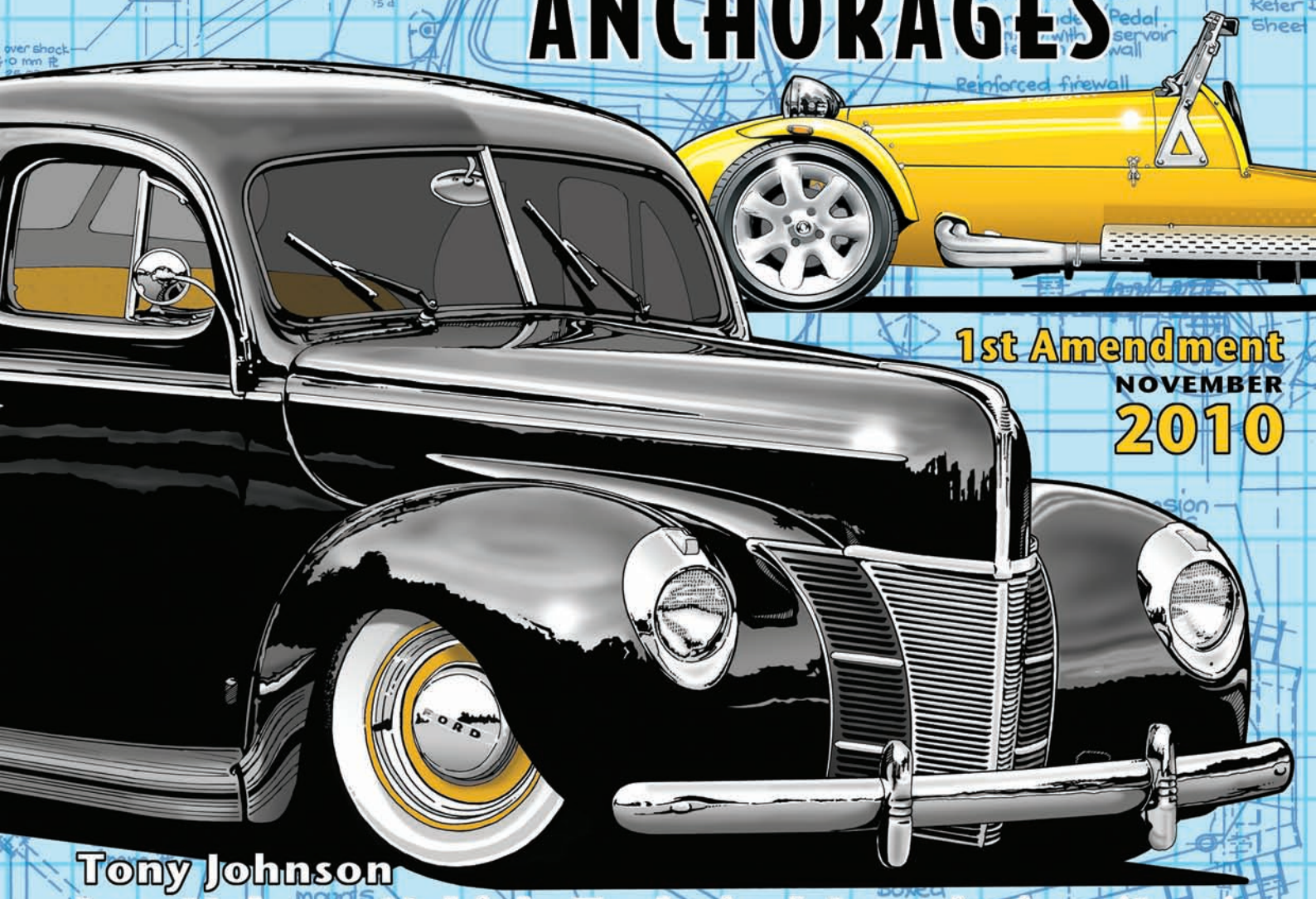
THE NEW ZEALAND

CAR CONSTRUCTION MANUAL

CHAPTER 14

SEATS, SEATBELTS, & ANCHORAGES



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CAR
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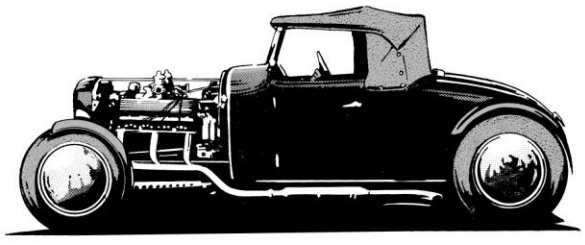

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The New Zealand Car Construction Manual was written by Tony Johnson of Auckland New Zealand, for the NZHRA, who originally commissioned the development of the Manual in 2002. Tony has continued to take responsibility for the on-going amendments to the Manual for NZHRA, and for LVVTA since LVVTA took ownership of the Manual in October 2010.

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

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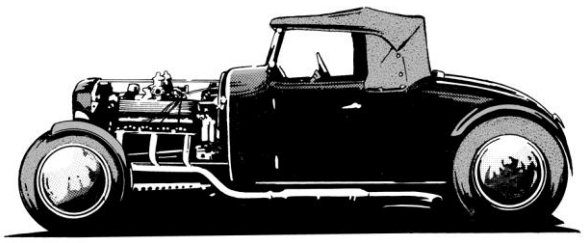

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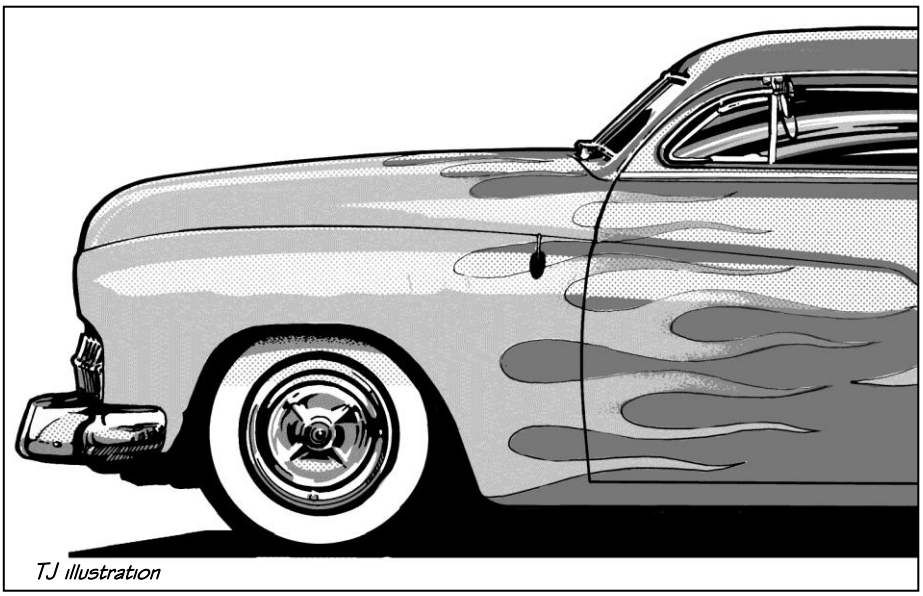
Chapter 14:

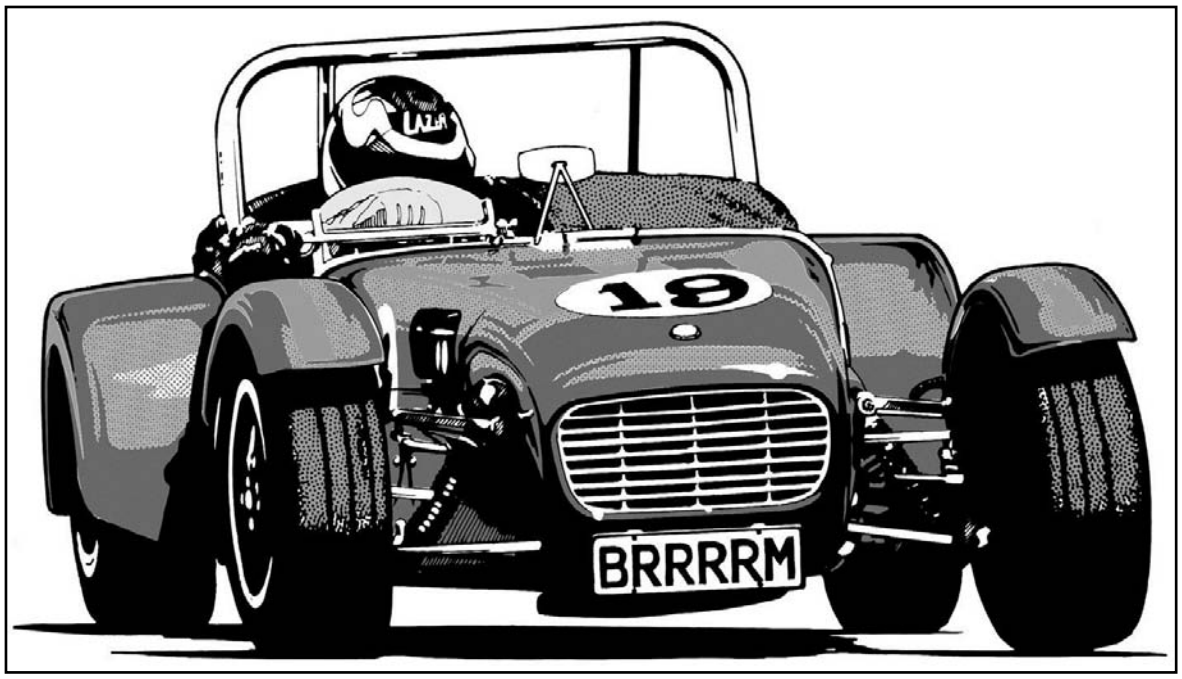
SEATS, SEATBELTS, & ANCHORAGES



Chapter 14 Contents:

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

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



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CHAPTER 14: SEATS, SEATBELTS, & ANCHORAGES

Introduction:

The most important safety feature any hobby vehicle can be equipped with is the combination of seatbelts that are correctly positioned and are securely attached to the vehicle structure, together with seats that will remain in position and securely attached to the vehicle structure, in the event of an impact. There are some safety features that will always be compromised to some extent in a one-off hobby vehicle, but there's no good reason or excuse anymore not to have Mum and the kids, and yourself for that matter, properly restrained should the unthinkable happen. Because of the massive loads applied to seatbelt anchorages by your bodyweight, multiplied many times over by the gravitational forces generated in a survivable impact, serious consideration and effort needs to go into sorting out just how the seatbelt anchorages are going to be attached to the vehicle. The same applies to the seats; - if they're not correctly designed and attached, and a failure occurs during an impact, the seatbelts can't do their job properly.

Note that where a production vehicle is fitted with its original unmodified seats, seatbelts, and anchorage systems, the requirements in this chapter do not apply.

General seat requirements:

14.1 Positioning requirements for all seats

14.1.1

A seat fitted to a low volume vehicle for the use of the driver is not required to be provided with adjustment in the longitudinal direction, however, it must in all cases be positioned in such a way as to enable the vehicle to be safely operated by a person within the average range of height and stature.

14.1.2

A seat that is adjustable in the longitudinal plane, that is fitted to a low volume vehicle, must be limited in its range of adjustment so as not to be able, at any point within its range of adjustment, to cause any seatbelt anchorage to be outside of its permitted area, as specified in 14.36 to 14.40.

14.2 Condition and operation requirements for all seats

14.2.1

A seat 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 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 a rearward collision, or rebound from a frontal collision.

14.2.2

A seat 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.

14.2.3

A seat fitted to a low volume vehicle must:

(a) *except for a scratch-built low volume vehicle, 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.*

14.3 Seating position dimensions

14.3.1

A multiple seat fitted to a low volume vehicle must contain, in the case of an adult's seat, no more seating positions than the total whole number of times 410 mm (16 ¾") can be divided into the total width of the seat.

14.3.1

This means, for example, that you couldn't have 3 seating positions on a bench seat that has a total width of 1100 mm (45"), as the total width of the seat is less than 3 x 410 mm = 1230 mm (50").

14.4 Entry and exit from seats

14.4.1

A 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.

14.4.2

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 practical, 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 (12") 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.*

14.4.3

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.*

Unstressed seat types and sources:

14.5 Unstressed seats from production vehicles

14.5.1

An unstressed seat from a production vehicle may be fitted to a low volume vehicle, provided that:

(a) *the vehicle to which the seat was originally fitted was manufactured in either:*

(i) *Australia on or after 1 January 1988; or*

14.5.1

An 'unstressed' seat is a seat that does not have any seatbelt anchorages attached to it, whereas a 'stressed' seat is a seat that has one or more seatbelt anchorages attached directly to the seat-frame. The seats in many modern production vehicles have at least one lap belt anchorage attached directly to the seat frame.

(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;*

and

(b) *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.*

14.5.1

An unstressed seat can be used from a production vehicle other than those specified in 14.5.1(a) provided that the LVV Certifier is satisfied, on the basis of a thorough visual inspection, that the design and strength of the frame of the seat being used is comparable to a seat from a vehicle specified in 14.5.1(a).

14.6 After-market unstressed seats

14.6.1

An after-market unstressed seat may be 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.*

14.6.1(c)

It 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. A seat that meets a recognised motor-sport standard such as FIA or SFI meets this requirement.

14.7 Custom one-off unstressed seats

14.7.1

A custom one-off unstressed seat may be 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 14.5 or 14.6, 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 LVVTA LVV Standard 185-00 (Seats and Seat Anchorages).

14.7.1

Where a seat is constructed on a one-off basis using composite materials, other than straight-forward hand lay-up fibre-glass, a satisfactory level of competence in the use of the material types used in the construction of the seat may be required to be demonstrated or proven to the LVV certifier.

14.7.2

Any welding carried out in relation to any seat modification or construction in a low volume vehicle, must meet all welding requirements specified in 18.7 and 18.8 of 'Chapter 18 - Attachment Systems'.

14.7.1(b)

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

14.8 Unstressed seats from other sources

14.8.1

An unstressed seat from sources other than those specified in 14.5 to 14.7, 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.

14.8.1

This 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.

Stressed seat types and sources:

14.9 Stressed seats from production vehicles

14.9.1

A stressed seat from a production vehicle may be fitted to a low volume vehicle, provided that:

(a) *the vehicle to which the seat was originally fitted was 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;*

and

(b) *any seatbelt anchorages that are fitted to the seat frame were installed by the manufacturer of the seat; and*

(c) *the seat is not modified in such a way as to reduce the original strength or rigidity of the seat structure.*

14.9.1

A 'stressed' seat is a seat that has one or more seatbelt anchorages attached directly to the seat-frame. The seats in many modern production vehicles have at least one lap belt anchorage attached directly to the seat frame.

Other seat requirements:

14.10 Head restraints

14.10.1

A head restraint, if fitted to a seat in a low volume vehicle, must either:

(a) be a part of a seat from a production vehicle specified in 14.5 or part of an aftermarket seat specified in 14.6; or

(b) meet the requirements specified for head restraints in LVVTA LVV Standard 185-40 (Head Restraints).

14.10.1

A head restraint is not mandatory, however, if fitted, a head restraint must comply with 14.10.1.

14.10.1(b)

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14.11 Seat hinging and latching mechanisms

14.11.1

A seat that was manufactured by a production vehicle manufacturer specified in 14.5 or 14.9, or by an aftermarket seat manufacturer specified in 14.6, 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.*

14.11.2

A seat, as specified in 14.11.1, fitted to a low volume vehicle that reclines, folds, or tilts, must incorporate a hinging and latching mechanism that:

(a) *holds the seat securely in the latched position; and*

(b) *operates smoothly and freely; and*

(c) *in the case of a latching system;*

(i) *locks into place automatically; and*

(ii) *can be readily accessed and operated; and*

(iii) *releases easily.*

14.12 Seat situations not catered for in this chapter

14.12.1

In addition to the requirements specified in this chapter, the applicable requirements of LVVTA LVV Standard 185-00 (Seats and Seat Anchorages) must be met in the case of a low volume vehicle that either:

(a) has specialised seats for a person with a disability; or

(b) has seats attached to an area where there is a false floor between the seats and the vehicle floor; or

(c) is a vehicle being operated as a passenger service vehicle; or

(d) has seats fitted in an open or enclosed cargo area; or

(e) has a seat that was not manufactured by a production vehicle or recognised aftermarket manufacturer, which incorporates a hinging and latching mechanism to enable reclining, folding, or tilting; or

(f) is fitted with a quick-release seat; or

(g) is fitted with a rearward-facing seat; or

(h) is fitted with a sideways-facing seat; or

(i) is fitted with a swivelling seat; or

(j) is fitted with a custom one-off or aftermarket stressed seat; or

(k) is fitted with a stressed seat from a production vehicle that has an upper seatbelt anchorage incorporated within the seat frame.

14.12.1

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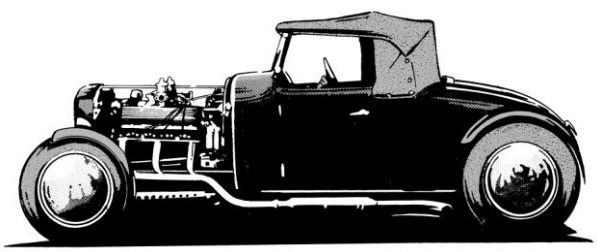

General seat attachment requirements:

14.13 General attachment requirements for all seats

14.13.1

A seat that is 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.

14.13.1

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.

14.13.2

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.

14.13.3

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.

14.13.4

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

14.13.5

Packers made from a mild steel material must be used as spacers to eliminate compressible air-gaps and ensure that a metal-to-metal contact is made where a seat or any part of a seat attachment system attaches to an uneven surface in a low volume vehicle such as a floor-pan with corrugations.

14.13.6

Where a part of the vehicle structure that is double-skinned lies between a seat and the opposite side of the structure of the low volume vehicle to which the seat attaches, and a packer cannot be inserted, the panel skins must be pulled firmly together to eliminate any air gaps between the skins.

14.13.7

Air gaps between two floor or panel surfaces of a low volume vehicle, to which a seat is fitted, may not be modified by hammering to avoid the necessity for installing packers.

14.13.8

The installation and attachment of a seat to a low volume vehicle must not involve any associated modifications that could weaken the vehicle structure.

Seat fastening and welding requirements:

14.14 Unstressed seat attachment

14.14

An 'unstressed' seat is a seat that does not have any seatbelt anchorages attached to it, whereas a 'stressed' seat is a seat that has one or more seatbelt anchorages attached directly to the seat-frame. The seats in many modern production vehicles have at least one lap belt anchorage attached directly to the seat frame.

14.14.1

An unstressed seat attached directly to the chassis (or sub-frame), or load-bearing cross-members in a low volume vehicle, must incorporate:

(a) as far toward the outer corners of the seat frame structure as practicable, not less than four fasteners 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;

and

(b) bracketry and mounting systems that follow time-proven best practice methods, and incorporate good design and construction techniques.

14.14.2

An unstressed seat attached to a panel steel floor in a low volume vehicle, must be attached to the floor as far toward the outer corners of the seat frame structure as practicable, with:

(a) not less than four fasteners 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;

and

(b) for each fastener, either:

(i) a doubler plate assembly that meets the requirements specified for a doubler plate assembly in 14.19 to 14.22; or

(ii) 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 3000 sq mm (122 sq "), with a width of not less than 30 mm (1 3/16"), under-floor mounting plates that meet the applicable requirements specified for under-floor mounting plates in 14.23 to 14.25.

14.15 Stressed seat attachment

14.15.1

A stressed seat may be attached directly to the chassis (or sub-frame), or load-bearing cross-members in a low volume vehicle, provided that the attachment system incorporates:

(a) as far toward the outer corners of the seat frame structure as practicable, not less than four fasteners 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

(b) bracketry and mounting systems that follow time-proven best practice methods, and incorporate good design and construction techniques.

14.15.2

A stressed seat may be attached to a panel steel floor of a low volume vehicle, provided that either:

(a) the requirements specified for the attachment of stressed seats in LVVTA LVV Standard 185-00 (Seats and Seat Anchorages) are met; or

(b) so far as is practicable, the installation method employed by the donor vehicle manufacturer is replicated, and the floor section to which the stressed seat is attached is either:

(i) comparable in specification to the floor of a vehicle that was designed by the manufacturer to be fitted with stressed seats; or

(ii) 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.

14.15

A 'stressed' seat is a seat that has one or more seatbelt anchorages attached directly to the seat-frame. The seats in many modern production vehicles have at least one lap belt anchorage attached directly to the seat frame.

14.15.1

This applies only to stressed seats with a lower seatbelt anchorage buckle attached to the seat frame. Any seat with an upper seatbelt anchorage attached to the seat frame must comply with LVV Standard 185-00.

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14.15.2(a)

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

14.16 Seat fastener requirements

14.16.1

A fastener used for the attachment of a 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 14.1); and*

(c) *be tightened to the applicable torque setting specified in Table 14.1.*

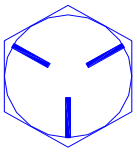
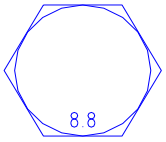
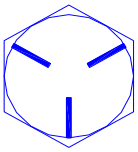
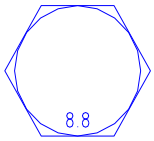
FASTENER GRADE	MARKING	SURFACE	TORQUE
5/16" Grade 5 imperial		un-plated	26 Nm (19 ft lb)
		plated	24 Nm (17.7 ft lb)
8 mm Grade 8.8 metric		un-plated	26 Nm (19 ft lb)
		plated	24 Nm (17.7 ft lb)
7/16" Grade 5 imperial		un-plated	51 Nm (37 ft lb)
		plated	48 Nm (35 ft lb)
12 mm Grade 8.8 metric		un-plated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

Table 14.1 Seat fastener grade and torque settings

14.17 Seat fastening through hollow sections

14.17.1

A seat anchorage fastener that is required to be positioned through a hollow section such as a chassis rail, sub-frame section, 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 (1/8"); 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.*

14.18 Seat attachment welding requirements

14.18.1

14.18.1

In the case of fabricated bracketry and mounting systems used to attach a seat to the body structure of a modified production low volume vehicle by welding, the bracketry and mounting systems must follow time-proven best practice methods, and incorporate good design and construction techniques.

Welding seat bracketry to the gearbox tunnel and outer sills is a common and acceptable method of attaching seats into motor-sport vehicles.

14.18.2

All welding carried out in relation to any seat mounting in a low volume vehicle, must meet all welding requirements specified in 18.7 and 18.8 of 'Chapter 18 - Attachment Systems'.

Seat anchorage doubler plates:

14.19 Seat doubler plate specifications

14.19

The idea of a doubler plate assembly is to use two plates, one on top of the floor and one under the floor, attached to each other and the floor, to spread any impact load over a larger floor area, and to ensure that the anchorage remains in place if the seat is removed.

14.19.1

A doubler plate assembly used to attach a 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) *be constructed from a mild steel material, with a nominal plate thickness of 3 mm (1/8"); and*

(c) *have a hole within the outer plate to accommodate the seat anchorage bolt, that:*

(i) *has a bolt clearance of no greater than 1 mm (1/24"); and*

(ii) *is located as centrally as practicable on the plate surface;*

and

(d) *incorporate a permanently fixed nut or threaded section of steel material having a minimum full thread depth of 9.5 mm (3/8"), of equal or greater size than either:*

(i) *in the case of an unstressed seat, 8 mm or 5/16 inch UNF; or*

(ii) *in the case of a stressed seat, 12 mm or 7/16 inch UNF.*

14.19.1(d)

When a drilling and tapping operation is carried out on a section of steel, a visual inspection must be undertaken by a low volume vehicle certifier prior to final fastener installation, to ensure that adequate thread form has been provided in the material.

14.20 Seat doubler plate surface area

14.20.1

A doubler plate assembly used to attach 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 sq mm (122 sq "), with not less than 30 mm (1 3/16") in width, which include those plate mating areas specified in Table 14.2.

80 mm x 50 mm (3 ¼" x 2")
100 mm x 30 mm (4" x 1 ¼")
100 mm x 40 mm (4" x 1 ¾")
140 mm x 40 mm (5 ¾" x 1 ¾")

Table 14.2 Seat doubler plate mating surface area

14.21 Seat doubler plate preparation

14.21.1

A doubler plate assembly used to attach a seat to a low volume vehicle must:

(a) *have all corners rounded to a radius of no less than 5 mm (3/16"); 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 (1/24"); 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.*

14.21.2

The surface of the area of a low volume vehicle to which a doubler plate assembly is used to attach a seat must be free from any sound deadening or other compressible material to ensure that a full metal-to-metal contact is made.

14.22 Seat doubler plate attachment

14.22.1

A doubler plate assembly used to attach a seat to a low volume vehicle must be aligned as closely as practical to parallel to the longitudinal centre-line of the vehicle. (see Diagram 14.1)

14.22.1

The alignment of the doubler plates must be such that the direction of pull during loading will not be applied against a corner of the plates.

14.22.2

A doubler plate assembly used to attach a seat to a low volume vehicle must be securely attached to the vehicle structure by a mechanical means, which must be positioned parallel to the longitudinal centre-line of the vehicle, and evenly distributed over the plate surface area, and may be either: (see Diagram 14.1)

(a) not less than two and not more than four mild steel Monel rivets, which:

(i) are no less than 3.2 mm (1/8") in diameter; and

(ii) are no less than 3.2 mm (1/8") longer than the combined thickness of the materials through which the rivet passes;

or

(b) not less than two and not more than four 5 mm (3/16") bolts; or

(c) not less than two and not more than four 5 mm (3/16") plug-welds or spot welds.

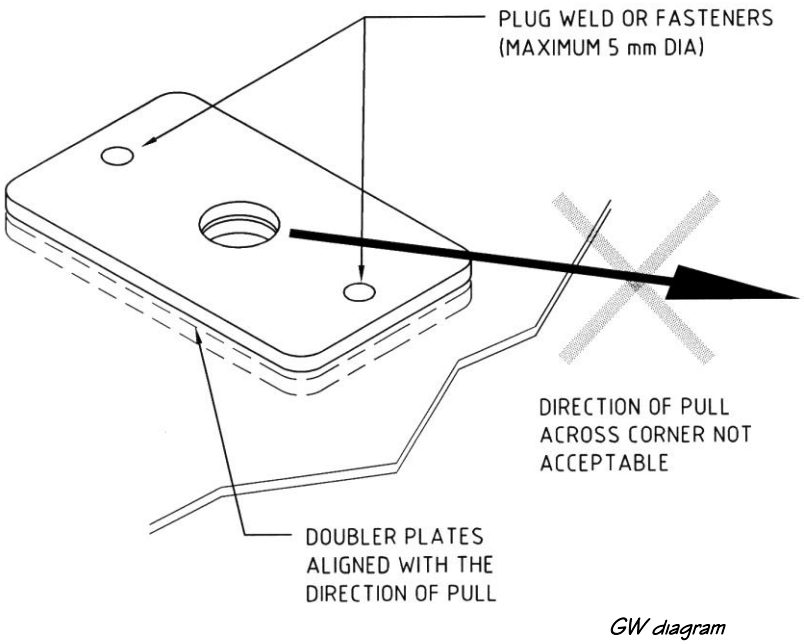


Diagram 14.1 Seat doubler plate attachment

Diagram 14.1

The two plates don't have to mirror each other – they can be of slightly different sizes and orientations, provided that the minimum area requirement for each plate is met.

The term 'fasteners' includes rivets.

14.22.3

A doubler plate assembly used to attach a seat to a low volume vehicle must be clamped together as tightly as practicable.

14.22.4

The attachment of a seat anchorage doubler plate assembly in a low volume vehicle must not involve any associated modifications that could weaken the vehicle structure.

Seat anchorage under-floor mounting plates:

14.23 Seat under-floor mounting plate specifications

14.23.1

An under-floor mounting plate used to attach a 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 (1/8"); and*

(c) *have a hole to accommodate the seat attachment bolt, that:*

(i) *has a bolt clearance of no greater than 1 mm (1/24"); and*

(ii) *is located as centrally as practicable on the plate surface;*

and

(d) *incorporate a permanently fixed nut or threaded section of steel material having a minimum full thread depth of 9.5 mm (3/8"), of equal or greater size than either:*

(i) *in the case of an unstressed seat, 8 mm or 5/16" UNF; or*

(ii) *in the case of a stressed seat, 12 mm or 7/16" UNF.*

14.24 Seat under-floor mounting plate surface contact area

14.24.1

An under-floor mounting plate used to attach a seat to a low volume vehicle must be of a size and orientation that enables a minimum surface contact area of 3000 sq mm (122 sq "), with not less than 30 mm (1 3/16") in width, which include those mounting plate surface contact areas specified in Table 14.3.

80 mm x 50 mm (3 ¼" x 2")
100 mm x 30 mm (4" x 1 ¼")
100 mm x 40 mm (4" x 1 ¾")
140 mm x 40 mm (5 ¾ x 1 ¾")

Table 14.3 Seat under-floor plate mating surface area

14.25 Seat under-floor mounting plate attachment

14.25.1

An under-floor mounting plate used to attach a seat to a low volume vehicle must be aligned as closely as practical to parallel to the longitudinal centre-line of the vehicle.

14.25.2

An under-floor mounting plate used to attach a seat to a low volume vehicle must be securely attached to the vehicle structure by a mechanical means, which must be aligned as closely as practical to parallel to the longitudinal centre-line of the vehicle, and evenly distributed over the plate surface area, and may be either:

(a) not less than two and not more than four mild steel Monel rivets, which:

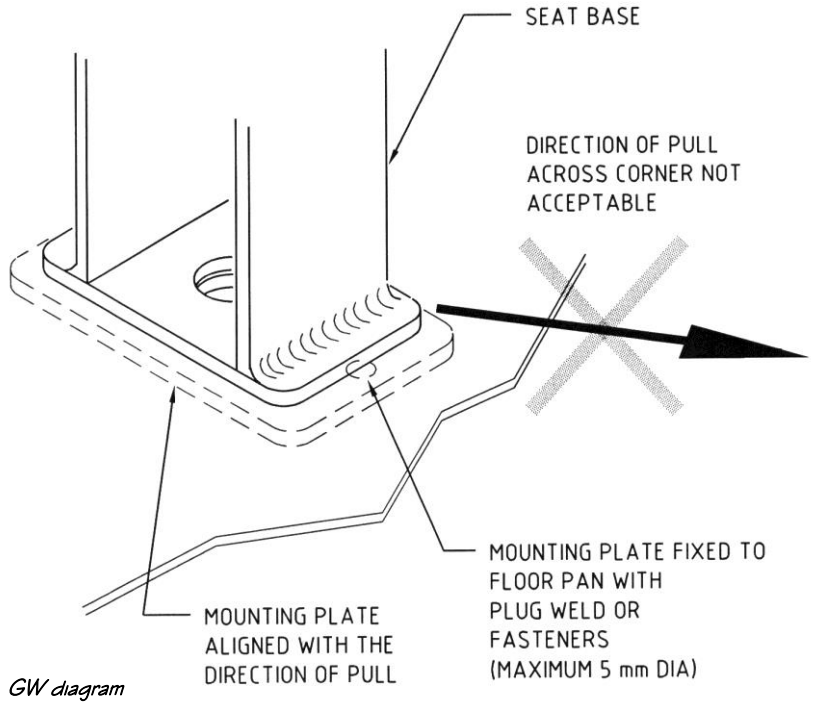
(i) are no less than 3.2 mm (1/8") in diameter; and

(ii) are no less than 3.2 mm (1/8") longer than the combined thickness of the materials through which the rivet passes;

or

(b) not less than two and not more than four 5 mm (3/16") bolts; or

(c) not less than two and not more than four 5 mm (3/16") plug-welds or spot welds.



GW diagram

Diagram 14.2 Seat under-floor mounting plate attachment

14.25.1

The alignment of the mounting plate must be such that the direction of pull during loading will not be applied against a corner of the plate.

Diagram 14.2

The term 'fasteners' includes rivets.

Seat attachment on uneven surfaces:

14.26 Seat doubler plate and under-floor mounting plate attachment on uneven surfaces

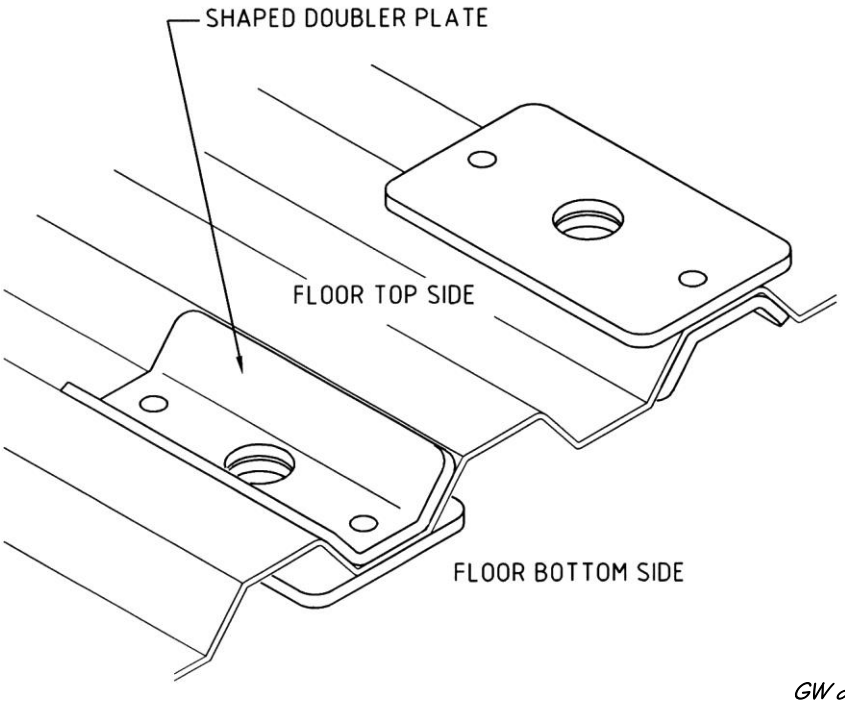
14.26.1

A doubler plate assembly or an under-floor mounting plate used to attach a seat to a low volume vehicle, where there is an uneven surface such as a floor-pan with corrugations, must maintain the required mating surface area, by either:

(a) where the doubler plate 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 14.3); or

14.26.1

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 providing the minimum contact areas are maintained.



GW diagram

Diagram 14.3 Doubler plates or underfloor mounting plates attached to uneven surfaces

(b) be supported by a packer that meets the requirements specified for packers in the LVVTA LVV Standard 185-00 (Seat and Seat Anchorages), positioned between the floor surface and the doubler plates or under-floor mounting plates.

14.26.1(b)

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

14.26.2

Where a doubler plate assembly or under-floor mounting plate is used to fit a seat to a section of a low volume vehicle where two or more panel skins lie between the two doubler plates or under-floor mounting plate, and a packer cannot be inserted, the skins must be pulled firmly together to eliminate any air gaps between the skins.

Other seat attachment requirements:

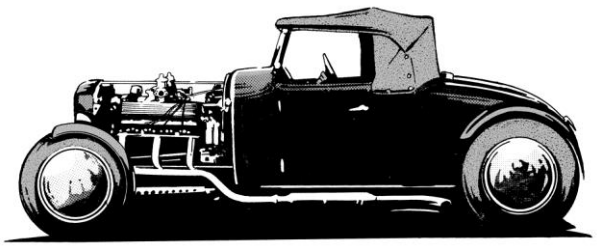
14.27 Seat attachment situations not covered in this chapter

14.27.1

In addition to the requirements specified in this Chapter, the applicable attachment requirements of LVVTA LVV Standard 185-00 (Seats and Seat Anchorages) must be met in the case of a low volume vehicle that has a seat specified in 14.12.

14.27.1

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



Seatbelt requirements:

14.28 Types of seatbelts required to be fitted

14.28.1

A seatbelt fitted to a low volume vehicle must be of a type specified for the seating position by Land Transport New Zealand, dependent on the vehicle's date of manufacture, date of first registration in New Zealand, Land Transport Table-A class, and in some cases other factors as may be applicable to special vehicles or circumstances.

14.29 Approved standards for seatbelts

14.29.1

A seatbelt fitted to a low volume vehicle must comply with one or more of the approved standards specified in Table 14.4.

14.28

These details are not listed in this manual because of the complexity of the subject, and the amount of space it would take up. A vehicle builder should consult an LVV Certifier early on, or refer to Section 7-5 of the 'Vehicle Inspection Requirements Manual: In-service certification', via the New Zealand Transport Agency website.

Purchase seatbelts only from reputable automotive parts suppliers or specialist seatbelt installers.

APPROVED STANDARD	ABBREVIATION
▪ Council Directive 77/541/EEC of 28 June 1977 on the approximation of the laws of the Member States relating to safety belts and restraint systems on motor vehicles	Capital 'E' inside a circle
▪ UN/ECE Regulation No. 16, Uniform provisions concerning the approval of safety belts and restraint systems for adult occupants of power-driven vehicles (E/ECE324-E/ECE/TRANS/505/Rev.1/Add.15)	(Applies to military vehicles only)
▪ Federal Motor Vehicle Safety Standard No. 209, Seat Belt Assemblies	FMVSS 209
▪ Australian Design Rule 4, Seat Belts	ADR 4
▪ Technical Standard for Seat Belt Assemblies (Japan)	JIS D4604
▪ Japanese Industrial Standard D 4604-1988, Seat Belts for Automobiles	JIS D4604
▪ New Zealand Standard 5401:1982, Specification for seat belt assemblies for motor vehicles	NZS 5401
▪ Australian Standard/New Zealand Standard 2596:1995, Specification for seat belt assemblies for motor vehicles	AS/NZS 2596
▪ South African Bureau of Standards 1080-1983, Standard specification for restraining devices (safety belts) for occupants of adult build in motor vehicles (Revised requirements)	SABS 1080

Table 14.4 Seatbelt approved standards table

14.30 Seatbelt condition requirements

14.30.1

A seatbelt fitted to a low volume vehicle must:

(a) be in good condition and operate correctly; and

(b) be securely attached to the seatbelt anchorage; and

(c) incorporate buckle and tongue assemblies that lock and release easily; and

(d) be protected from the entry of foreign matter.

14.30.2

Seatbelt webbing in a seatbelt fitted to a low volume vehicle must not:

(a) be ripped, frayed, or torn; or

(b) be stretched or damaged by impact loading; or

(c) faded to the extent that the colour has been bleached; or

(d) incorporate any stitching that has become damaged or undone; or

(e) dyed post-manufacture; or

(f) repaired or modified in any way.

14.30

Note that seatbelt components must be part of a matched set; – in other words, you can't use a buckle from one seatbelt set with a tongue from a seatbelt set of a differing make, or one that meets a different standard.

14.30.1

Buying seatbelts that have come from an old vehicle or an accident damaged vehicle should be avoided – ultra-violet light degradation and impact loading can both cause damage and weakening to seatbelt webbing that isn't always visible.

14.31 Seatbelts in old vehicles and scratch-built vehicles

14.31.1

A web-clamp inertia reel retractor lap and diagonal seatbelt must be fitted for each front outboard seating position, and a lap seatbelt must be fitted for each front centre seating position and each rear seating position, in:

(a) every scratch-built low volume vehicle built after 2003, both with and without a fixed roof; and

(b) a modified production low volume vehicle, both with and without a fixed roof, that has undergone significant mechanical modifications, carried out for the specific purpose of achieving a substantial performance improvement, and thereby changing the vehicle's driving characteristics to more that of a modern vehicle.

A modified production low volume vehicle that was completed before 1 January 2009 is not required to comply with 14.31.1(b).

14.31.1

It is recognised that there are many situations where a web-clamp retractor seatbelt can't be used, because of the limited orientations for which they are designed (generally for mounting at the bottom of a B-pillar). If it is not practical to use a web-clamp retractor, a normal inertia-reel retractor lap and diagonal seatbelt must be used.

14.31.1(b)

See the note margin on the next page for details on 14.31.1(b).

14.32 Full-harness seatbelts

14.32.1

A three, four, five, or six point full-harness seatbelt may be fitted for the two front outer seating positions in a low volume vehicle, provided that the vehicle is issued with a current and valid LVV Authority Card, as specified in 'Chapter 3 – LVV Authority Cards'.

14.32.2

A three, four, five, or six point full-harness seatbelt may be fitted for the two front outer seating positions in a low volume vehicle, without the requirement for an LVV Authority Card, provided that:

(a) the vehicle:

(i) is a scratch-built low volume vehicle; and

(ii) has no more than one row of seats;

and

(b) the seatbelt meets either:

(i) one or more of the approved standards specified in Schedule 2 of the Land Transport Rule: Seatbelts and Seatbelt Anchorages 2002 (Rule 32011); or

(ii) an approved SFI or FIA standard applicable for international motor-sport purposes;

and

(c) all controls, both essential and non-essential to the driving operation of the vehicle, can be operated by the driver whilst in the normal driving position and with the seatbelt correctly adjusted; and

(d) a rear-view mirror is fitted to the interior, and one rear-view mirror is fitted externally to each side of the vehicle, all of which comply with the applicable requirements for rear-view mirrors in 'Chapter 15 – Glazing and Vision; and

(e) a head restraint is fitted for each seating position fitted with a full-harness seatbelt, that meets the requirements specified for head restraints in 14.10.

14.31.1(b)

See 'Seatbelts in old cars' in 'Useful Information' section at the end of this chapter to gain a clearer understanding of the types of vehicles that this requirement is aimed at.

This requirement is only aimed at vehicles built after 2009 where the seatbelt anchorages can be incorporated into the structure during the car's construction, and does not apply to a vehicle built prior to 2009 and then subsequently repowered.

14.32.1

See 'Chapter 3 – LVV Authority Cards' for eligibility criteria and approval details.

14.32.1 & 14.32.2

A three-point harness seatbelt is usually a retractable type. Note that the positioning of the upper anchorage for a 3-point full-harness seatbelt will differ from 4 or more point seatbelts, as the upper anchorage will need to be central to the seat.

14.33 Retractor positioning requirements

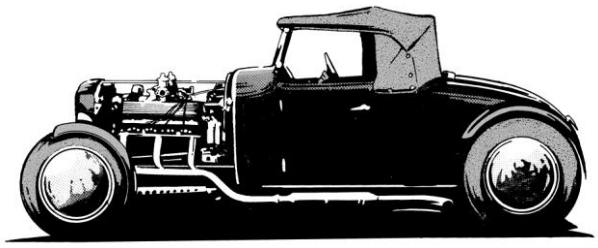
14.33.1

A retractor used within a seatbelt system fitted to a low volume vehicle must be mounted in a position that is not more than 5 degrees on either side of the operating angle of the retractor unit specified by the seatbelt manufacturer.

14.34 Interior trim requirements

14.34.1

Interior trim surrounding seatbelt anchorages fitted to a low volume vehicle must be positioned so that no rubbing or binding between the seatbelt and surrounding trim throughout all likely directions of pull of the seatbelt can occur.



General seatbelt anchorage requirements:

14.35 General requirements for all seatbelt anchorages

14.35.1

A seatbelt anchorage in a low volume vehicle must:

(a) attach to a permanent part of the vehicle structure such as a chassis or sub-frame rail, cross-member, pillar, floor section, or inner wheel arch; and

(b) not involve any modifications that could weaken the vehicle structure.

14.35.2

A seatbelt anchorage 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, or a combination of plywood and fibreglass.

14.35.3

A B-pillar into which an upper seatbelt anchorage is attached, in an old coach-built style modified production low volume vehicle, or a fibreglass-bodied scratch-built low volume vehicle, must be strengthened and reinforced as necessary, to ensure that the B-pillar, and the way in which it is attached to the vehicle structure, is as strong as the upper seatbelt anchorage itself.

14.35.3

See 'Upper seatbelt anchorage capping plates for pillar reinforcement' in the 'Useful Information' section at the back of this chapter for guidelines on how to achieve this.

14.35.4

Air gaps between two floor or panel surfaces of a low volume vehicle to which a seatbelt anchorage is attached, may not be modified by hammering to avoid the necessity for installing packers.

Seatbelt anchorage positioning:

14.36 Permitted area for upper seatbelt anchorages (vehicles with a permanent roof structure)

14.36.1

An upper seatbelt anchorage in a low volume vehicle with a permanent roof structure, must, where no anchorage was provided by the original vehicle manufacturer, or where the vehicle is a new scratch-built vehicle, be fitted in a position within the area specified in 14.36.2 to 14.38, determined by either:

(a) an LVVTA Body Frame; or

(b) measured from a LVVTA H-point template, as shown in Diagram 14.4.

14.36.1(a)

An LVV Certifier has an LVVTA Body Frame.

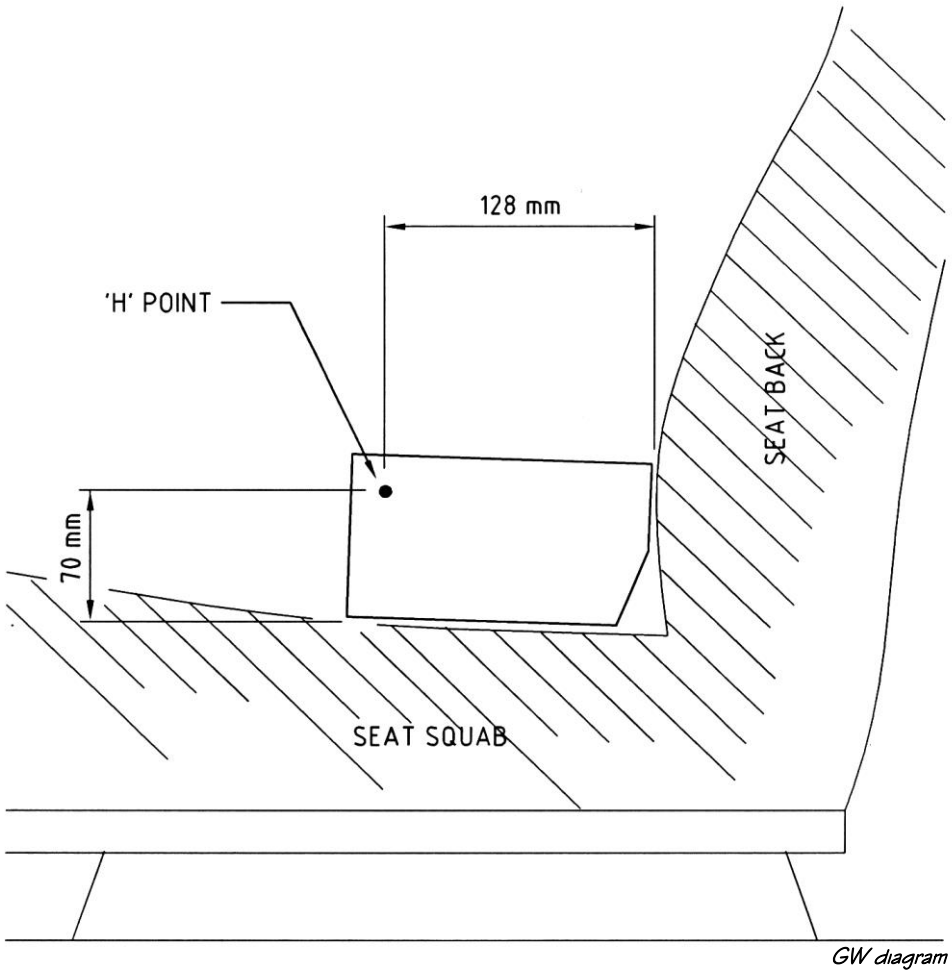


Diagram 14.4 LVVTA H-point template

14.36.2

With the seat at the mid-point of its fore-aft extension and the seat-back reclined to a normal driving position, an upper seatbelt anchorage in a low volume vehicle must be positioned:

(a) in the fore-aft direction, no further forward than a line that follows the front face of the seat back (see Diagram 14.5); and

(b) at a height of between 560 mm (22 ¾") and 710 mm (29"), measured from the H-point following the front face of the seat back (see Diagram 14.5); and

14.36.2(a)

It is important to have the upper anchorage positioned as far back as possible (provided that the seatbelt can be easily reached). This ensures that the belt is in the right position relative to the shoulder, and will therefore restrain the occupant during an impact.

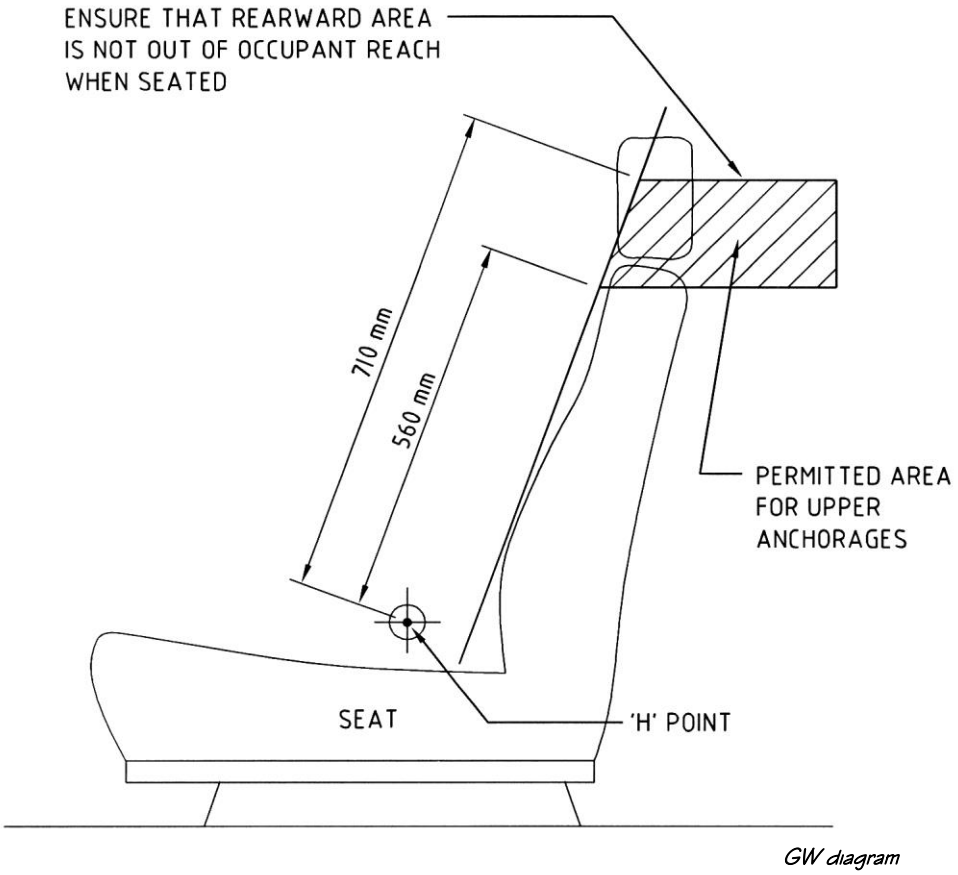


Diagram 14.5 Permitted area for upper anchorages (side view)

(c) at a width of between 140 mm (5¾") and 500 mm (20½") from the longitudinal centre-line of the seat. (see Diagram 14.6)

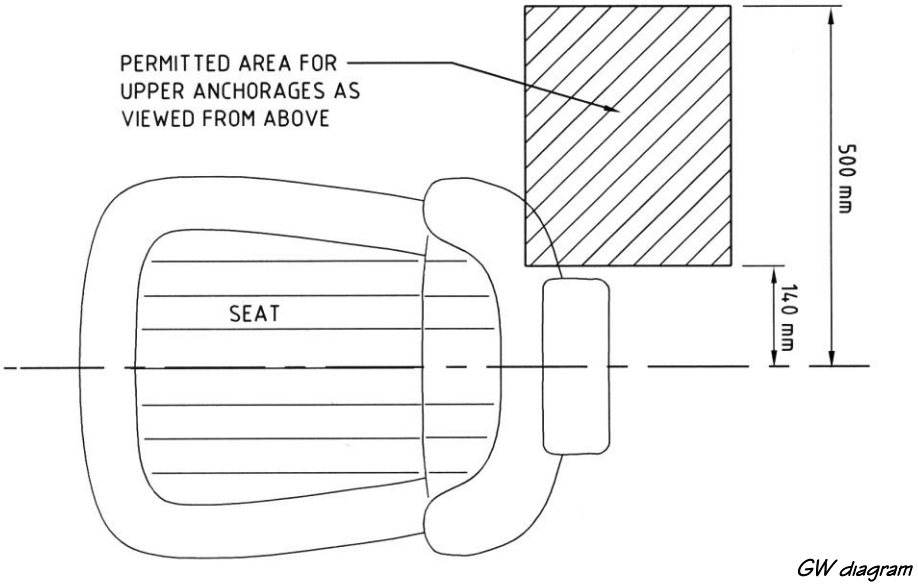


Diagram 14.6 Permitted area for upper anchorages (top view)

14.37 Permitted area for upper seatbelt anchorages in old vehicles

14.37.1

A low volume vehicle that has its B-pillar in such a position in relation to the seat, that the upper seatbelt anchorage cannot be positioned behind a line that follows the front face of the seat-back, must have the upper seatbelt anchorage positioned as close to the permitted area specified in 14.36.2(a) as is practically achievable.

14.37.1

Many older vehicles, particularly 1940s and earlier, have the B-pillar sitting beside, and even forward, of the seat back, which makes the correct positioning of the upper seatbelt anchorage virtually impossible, particularly on a 4-door vehicle.

14.38 Permitted area for upper seatbelt anchorages (vehicles with no permanent roof structure)

14.38.1

An upper seatbelt anchorage position in a low volume vehicle that does not have a permanent roof structure, and therefore cannot have the upper seatbelt anchorage positioned between 560 mm (22 ¾") and 710 mm (29") from the H-point, must be fitted in a position as close to the permitted area specified in 14.36.2(b) as is practically achievable.

14.39 Permitted area for lower seatbelt anchorages

14.39.1

A lower seatbelt anchorage in a low volume vehicle must, where no anchorage was provided by the original vehicle manufacturer or where the vehicle is a new scratch-built vehicle, be fitted in a position within the area specified in 14.39.2, determined by either:

(a) an LVVTA Body Frame; or

(b) measured from a LVVTA H-point template, as shown in Diagram 14.4.

14.39.1(a)

An LVV Certifier has an LVVTA Body Frame.

14.39.2

With the seat at the mid-point of its fore-aft extension and the seat-back reclined to a normal driving position, a lower seatbelt anchorage in a low volume vehicle must be positioned:

(a) in the fore-aft direction, rearwards from the H-point by between 17% and 100% of the distance between the H-point and the floor directly below the H-point (see Diagram 14.7); and

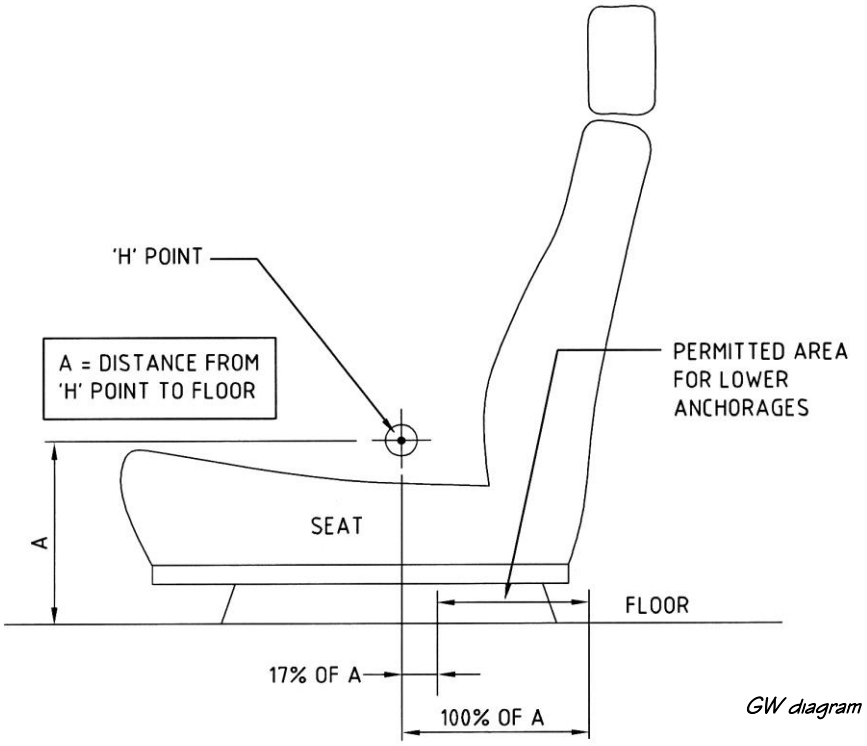


Diagram 14.7 Permitted area for lower anchorages (side view)

(b) at a width of no closer to each side of the centre-line of the seating position than 175 mm (7 1/8"), and no further from the centre-line of the seating position than 250 mm (10 ¼") (see Diagram14.8).

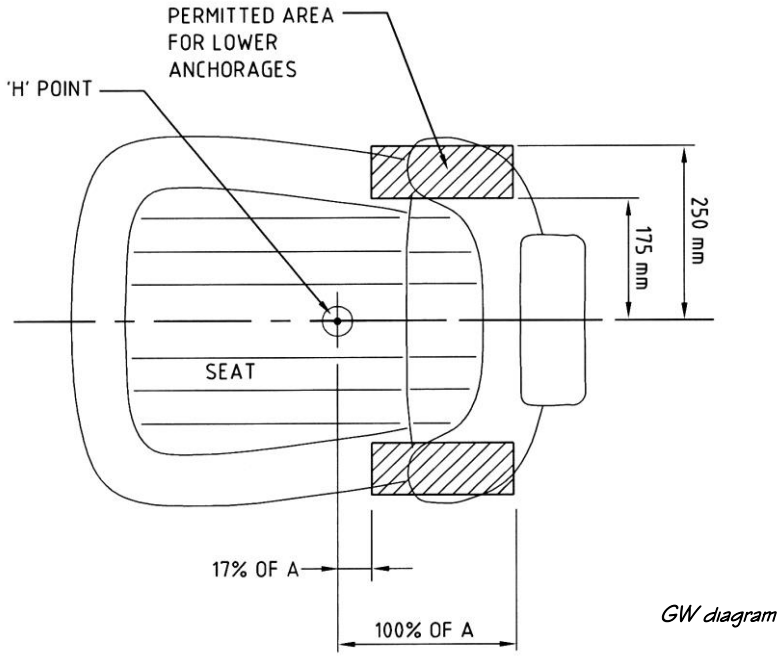


Diagram 14.8 Permitted area for lower anchorages (top view)

14.40 Permitted area for full harness seatbelt anchorages

14.40.1

A full-harness seatbelt fitted to a low volume vehicle must be positioned within the area specified by the applicable technical requirements of MotorSport New Zealand or the New Zealand Drag Racing Association, as appropriate to the type of vehicle to which the full harness is fitted.

Seatbelt anchorage fastening and welding requirements:

14.41 Fastening requirements for all seatbelt anchorages

14.41.1

14.41.1

In every seatbelt anchorage application possible, a bolt designed specifically for seatbelt anchorages should be used. Where it is necessary to use a different kind of bolt (such as where extra length is needed due to chassis rail through-bolting), a socket head cap-screw bolt must not be used, because of the small head area.

A fastener used for the attachment of a seatbelt to a seatbelt anchorage in a low volume vehicle must be a fastener which is either:

(a) supplied by the manufacturer of the seatbelt being fitted; or

(b) 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.

14.41.2

A fastener used for the attachment of a seatbelt to a seatbelt anchorage in a low volume vehicle must:

(a) incorporate a suitable size washer under the bolt head so as to spread the load of the anchorage against the bolt head in an impact; and

(b) where a seatbelt needs to be able to swivel, be a stepped bolt or incorporate a spacer; and

(c) be lightly coated with lubricant over the thread section; and

(d) have its tensile strength grade identified in order to establish the correct torque setting for the fastener (see Table 14.5); and

(e) be tightened to the applicable torque setting specified in Table 14.5.

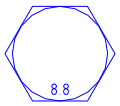
FASTENER GRADE	MARKING	SURFACE	TORQUE
7/16" Grade 5 imperial		un-plated	51 Nm (37 ft lb)
		plated	48 Nm (35 ft lb)
12 mm Grade 8.8 metric		un-plated	89 Nm (65 ft lb)
		plated	83 Nm (61 ft lb)

Table 14.5 Seatbelt fastener grade and torque settings

14.42 Seatbelt anchorage fastening through hollow sections

14.42.1

A seatbelt anchorage fastener that is required to be positioned through a hollow section such as a chassis rail (or 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 seatbelt anchorage fastener passes, that:

(a) *is constructed from a mild steel material, with a nominal wall thickness of 3 mm (1/8"); 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 seatbelt anchorage fastener's attachment.*

14.43 Seatbelt anchorage welding requirements

14.43.1

In the case of fabricated bracketry and mounting systems used to attach a seatbelt anchorage to the body structure of a low volume vehicle by welding, the bracketry and mounting systems must follow time-proven best-practice methods, and incorporate good design and construction techniques.

14.43.2

All welding carried out in relation to any seatbelt anchorages in a low volume vehicle must meet all welding requirements specified in 18.7 and 18.8 of 'Chapter 18 - Attachment Systems'.

Seatbelt anchorage doubler plates:

14.44 Seatbelt anchorage doubler plate specifications

14.44.1

For all panel steel applications, other than those specified in 14.50 to 14.53, a doubler plate assembly must be used to attach a seatbelt anchorage to a low volume vehicle, which must:

(a) *always consist of two plates, one on each side of the vehicle structure to which the anchorage is attached; and*

(b) *be constructed from a mild steel, with a nominal plate thickness of 3 mm (1/8"); and*

(c) *have a hole within the outer plate to accommodate the seatbelt anchorage bolt, that:*

  (i) *has a bolt clearance of no greater than 1 mm (1/24"); 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 seatbelt, to accept a fastener specified in 14.41, a permanently fixed nut or threaded section of steel material having a minimum full thread depth of 9.5 mm (3/8"), of equal or greater size than either:*

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

  (ii) *12 mm metric.*

14.45 Seatbelt anchorage doubler plate surface area

14.45.1

A doubler plate assembly used in a seatbelt anchorage in 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 (122 sq "), with not less than 30 mm (1 3/16") in width, which include those plate mating areas specified in Table 14.6.

14.44

The idea of a doubler plate assembly is to use two plates, one on top of the floor and one under the floor, attached to each other and the floor, to spread any impact load over a larger area of floor, and to ensure that the anchorage remains in place if the seatbelt is removed.

14.44.1

'Panel steel applications' means where the anchorage is going into the floor or the pillar, as opposed to a chassis rail, cross-member, or roll-bar.

14.44.1(d)

When a drilling and tapping operation is carried out on a section of steel, a visual inspection must be undertaken by a low volume vehicle certifier prior to final fastener installation, to ensure that adequate thread form has been provided in the material.

80 mm x 50 mm (3 1/4 x 2")
100 mm x 30 mm (4" x 1 ¼")
100 mm x 40 mm (4" x 1 ¾")
140 mm x 40 mm (5 ¾" x 1 ¾")

Table 14.6 Seatbelt doubler plate mating surface area

14.46 Seatbelt anchorage doubler plate preparation

14.46.1

A doubler plate used to attach a seatbelt anchorage to a low volume vehicle must:

(a) *have all corners rounded to a radius of no less than 5 mm (3/16"); 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 (1/24"); 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.*

14.46.2

The surface of the area of a low volume vehicle to which a doubler plate assembly used to attach a seatbelt anchorage must be free from any sound deadening or other compressible material to ensure that a full metal-to-metal contact is made.

14.47 Seatbelt anchorage doubler plate attachment

14.47.1

A doubler plate assembly used to attach a seatbelt anchorage to a low volume vehicle must be aligned as closely as practical to parallel to the longitudinal centre-line of the vehicle.

14.47.2

A doubler plate assembly used to attach a seatbelt anchorage to a low volume vehicle must be securely attached to the vehicle structure by a mechanical means, which must be positioned parallel to the longitudinal centre-line of the vehicle, and evenly distributed over the plate surface area, and may be either: (see Diagram 14.9)

14.47.2

The alignment of the doubler plates must be such that the direction of pull during loading will not be applied against a corner of the plate.

(a) not less than two and not more than four mild steel Monel rivets, which:

(i) is no less than 3.2 mm (1/8″) in diameter; and

(ii) is no less than 3.2 mm (1/8″) longer than the combined thickness of the materials through which the rivet passes;

or

(b) not less than two and not more than four 5 mm (3/16″) bolts; or

(c) not less than two and not more than four 5 mm (3/16″) plug-welds or spot welds.

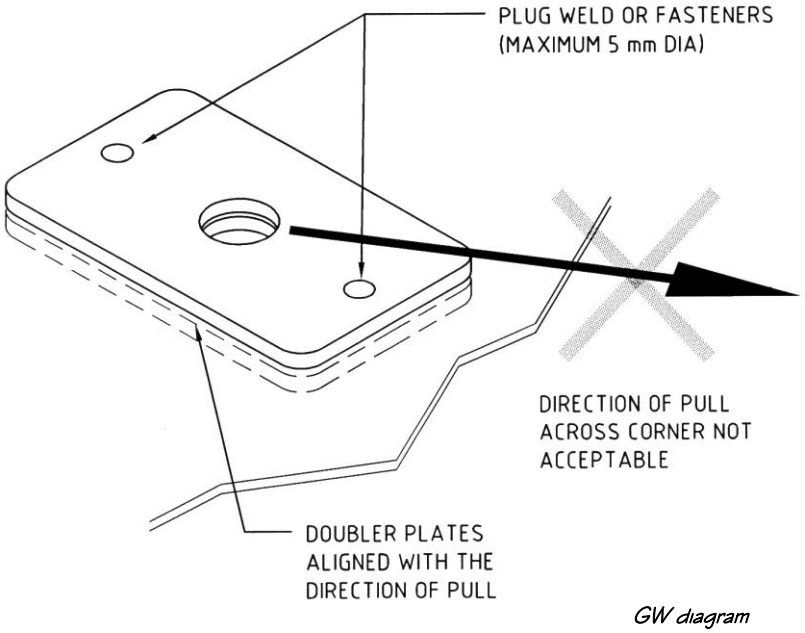


Diagram 14.9 Seatbelt anchorage doubler plate attachment

Diagram 14.9

The two plates don't have to mirror each other – they can be of slightly different sizes and orientations, provided that the minimum area requirement for each plate is met.

14.47.3

A doubler plate assembly used to attach a seatbelt anchorage to a low volume vehicle must be clamped together as tightly as practicable.

14.47.4

The attachment of a seatbelt anchorage doubler plate assembly in a low volume vehicle must not involve any associated modifications that could weaken the vehicle structure.

14.48 Seatbelt anchorage doubler plate attachment on uneven surfaces

14.48.1

A doubler plate assembly used to attach a seatbelt anchorage to a low volume vehicle, where there is an uneven surface such as a floor-pan with corrugations, must maintain the required mating surface area, by either:

(a) where the doubler plate interferes with changes in the contour of the floor, be shaped to conform to the floor contour changes (see Diagram 14.10); or

14.48.1

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 providing the minimum contact areas are maintained.

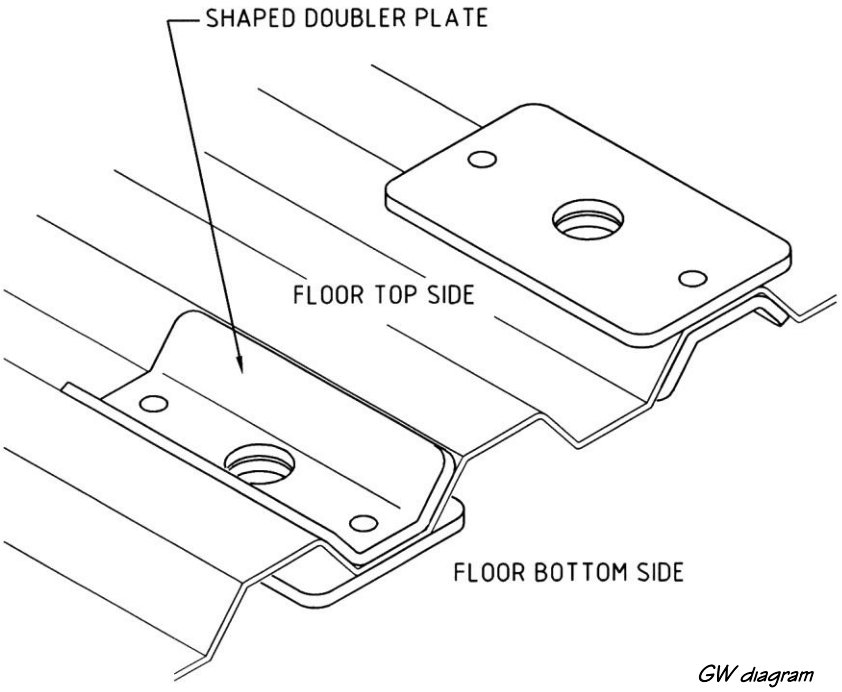


Diagram 14.10 Seatbelt anchorage doubler plates attached to uneven surfaces

(b) be supported by a packer that meets the requirements specified for packers in the LVVTA LVV Standard 175-00 (Seatbelt Anchorages), positioned between the floor surface and the doubler plates.

14.48.1(b)

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

14.48.2

Where a doubler plate assembly is used to fit a seatbelt anchorage to a section of a low volume vehicle where two or more panel skins lie between the two doubler plates, and a packer cannot be inserted, the skins must be pulled firmly together to eliminate any air gaps between the skins.

14.49 Stiffening new sheet steel floors to support doubler plates

14.49.1

A low volume vehicle that has seatbelt anchorages attached to a custom-built floor that is made from mild steel sheet thinner than 1.2 mm (18-gauge), and does not incorporate any method of floor reinforcement such as rolled swages, or body seams or folds within 150 mm (6") in any direction from a doubler plate assembly, must have stiffeners fitted to the floor to support the doubler plate assemblies, that are: (see Diagram 14.11)

(a) positioned parallel to the longitudinal centre-line of the vehicle, and span the greatest distance as can be practically achieved; and

(b) positioned on the underside of the floor within 150 mm (6") of each doubler plate assembly; and

(c) attached to the floor by plug-welding at intervals of not more than 30 mm (1 3/16").

14.49.1

Suitably sized round tube, RHS, or C-section may be used. 25 mm x 25 mm (1" x 1") top-hat section is ideal.

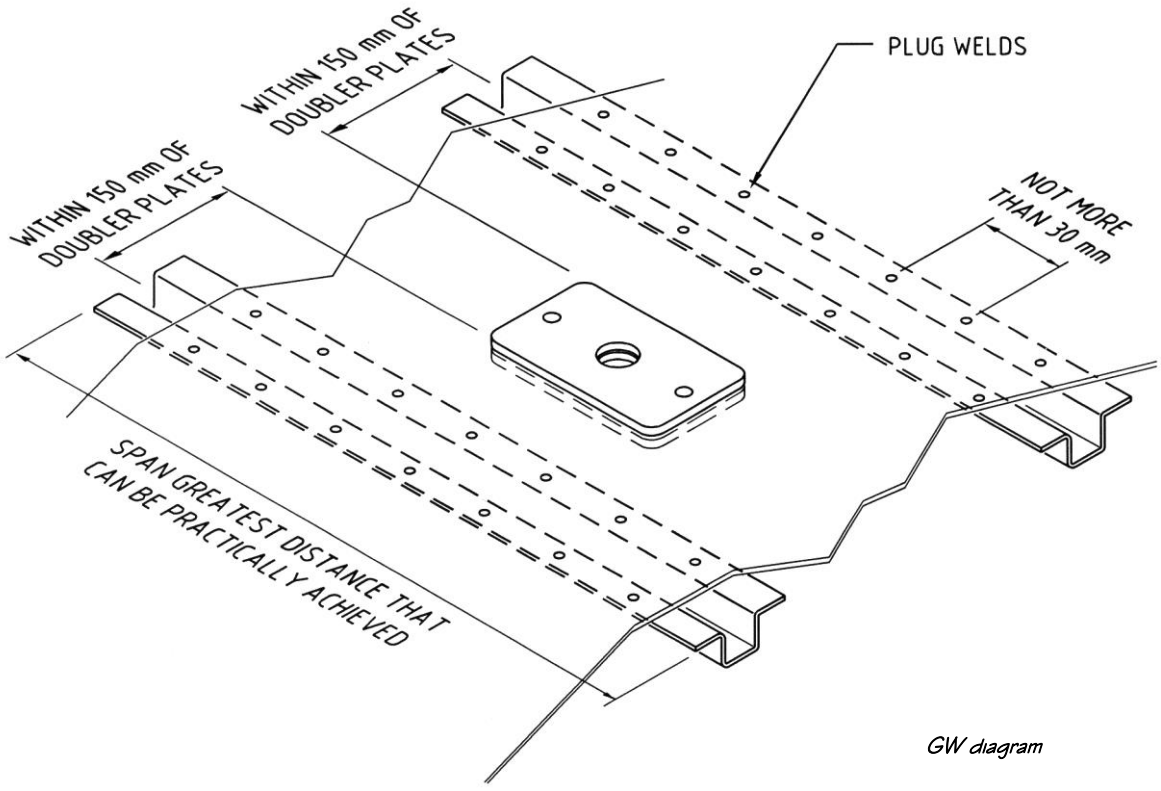


Diagram 14.11 Floor stiffeners to support seatbelt anchorage doubler plates

Alternatives to seatbelt anchorage doubler plates:

14.50 OE-style lower seatbelt anchorage mounting plates

14.50.1

An OE-style lower seatbelt anchorage under-floor mounting plate may be fitted to the floor in a low volume vehicle as an alternative to the requirement for doubler plates specified in 14.44 to 14.48, provided that:

(a) the under-floor mounting plates are either an original equipment item, or a reproduction part manufactured to original equipment specifications, and were intended for a vehicle of a similar era and construction type as the vehicle in question; and

(b) the vehicle manufacturer's method of attachment to the vehicle floor has been replicated as closely as can be practically achieved.

14.50.1

This type of anchorage is commonly used in restorations of 1950s and 1960s American vehicles. This means that the oval style of plate fitted to 1950s and '60s Chevrolets could be used on all vehicles of that era, provided that the vehicle floor is made from approximately the same type and thickness material as that which the plates were originally designed for.

14.51 Over-pillar upper seatbelt anchorage mounting plates

14.51.1

An over-pillar upper seatbelt anchorage mounting plate may be fitted to a B-pillar in a low volume vehicle as an alternative to the requirement for doubler plates specified in 14.44 to 14.48, in the case of where the B-pillar is too narrow or too extreme in shape to enable the use of a doubler plate system, provided that: (see Diagram 14.12)

(a) the same design, surface area, and preparation specifications required for doubler plates in 14.44 to 14.48 is achieved; and

(b) the permanently fixed nut or threaded section of steel referred to in 14.44.1(d) is recessed into the B-pillar; and

(c) the mounting plate is shaped to conform with the profile of the face of the B-pillar; and

(d) the mounting plate is fully welded around its circumference to the B-pillar.

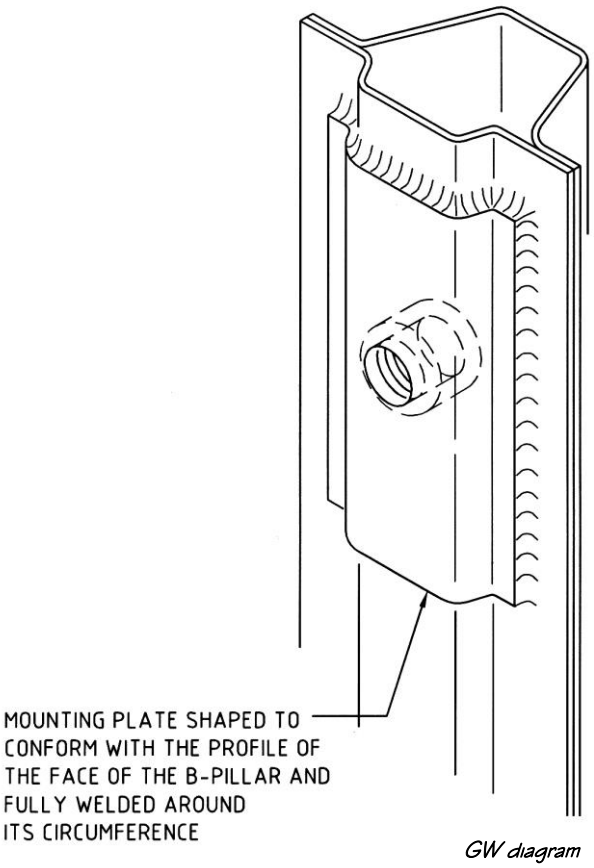


Diagram 14.12 Mounting plates for upper seatbelt anchorages in B-pillars

Diagram 14.12

Where this option is used, the panel seam or join in the surrounding structure 100 mm (4") above the top edge and 100 mm (4") below the bottom edge of the mounting plate must be reinforced at a spacing of between 30 mm (1 ¼") and 40 mm (1 ¾"), by plug welds of no less than 8 mm (5/16") in diameter, through a hole of no less than 8 mm (5/16") in diameter drilled in one skin only.

14.52 Inside-pillar upper seatbelt anchorage mounting plates

14.52.1

An inside-pillar upper seatbelt anchorage mounting plate may be fitted to a B-pillar in a low volume vehicle as an alternative to the requirement for doubler plates specified in 14.44 to 14.48, in the case of where the B-pillar is too narrow or too extreme in shape to enable the use of a doubler plate system, provided that: (see Diagram 14.13)

(a) the shape of the pillar is supported by additional material to achieve a plate assembly that is shaped to conform with the profile of the inside face of the B-pillar; and

(b) the cavity to allow the seatbelt anchorage bolt to attach to the mounting plate is minimised as much as is practically achievable.

14.52.1

9.5 mm (3/8") mild steel rod welded centrally down an 80 x 50 mm (3 ¼" x 2") plate works perfectly for many 1950s and '60s American vehicles, in particular mid-'50s Chevys.

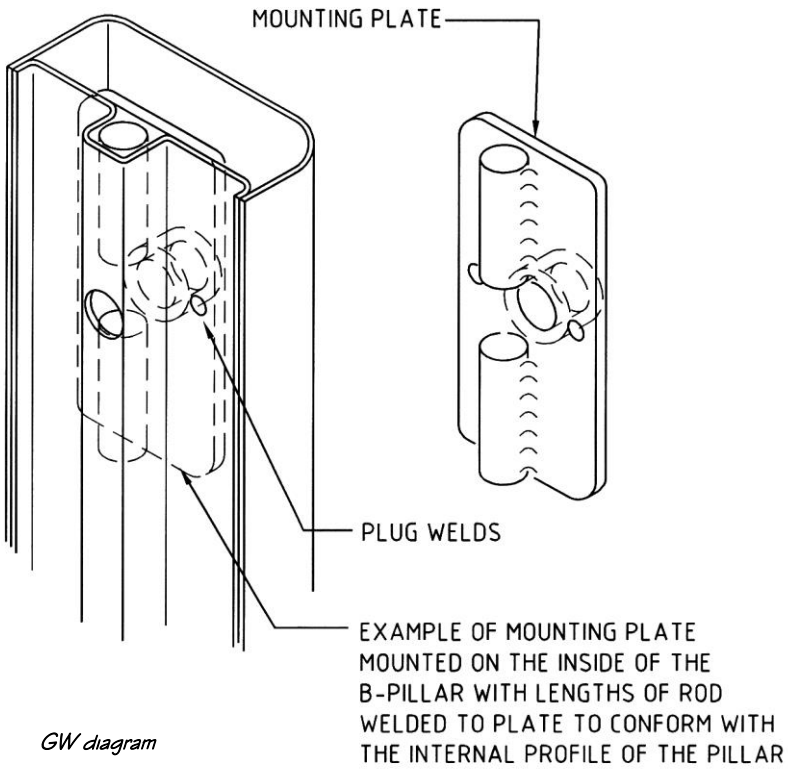


Diagram 14.13 Inside-pillar upper seatbelt anchorage mounting plate

Diagram 14.13

Where this option is used, the panel seam or join in the surrounding structure 100 mm (4") above the top edge and 100 mm (4") below the bottom edge of the mounting plate must be reinforced at a spacing of between 30 mm (1 ¼") and 40 mm (1 ¾"), by stitch welds of no less than 8 mm (5/16") in length.

14.53 Through-pillar upper seatbelt anchorage systems

14.53.1

A through-pillar upper seatbelt anchorage mounting system may be fitted to a B-pillar in a low volume vehicle as an alternative to the requirement for doubler plates specified in 14.44 to 14.48, in the case of where the B-pillar is too narrow or too extreme in shape to enable the use of a doubler plate system, provided that: (see Diagram 14.14)

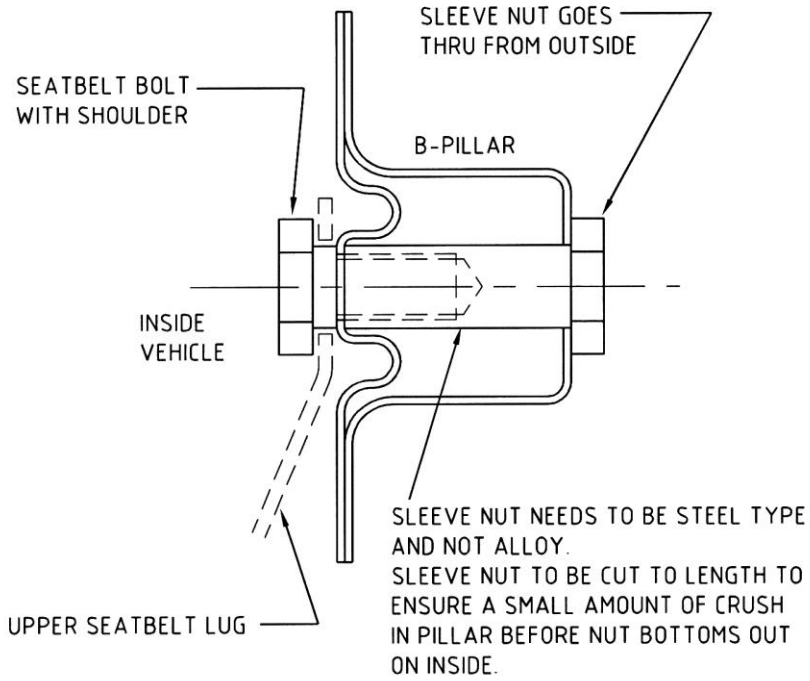
(a) the vehicle in question is a pre-1979 vehicle with substantially-constructed B-pillars; and

(b) the system is double-supported within the pillar, by the bolt head pressing against the external face on the outside of the pillar, and the steel sleeve pressing against the internal face on the inside of the pillar; and

(c) the sleeve is machined to fit snugly within the confines of the pillar, and has the pillar pre-loaded against it.

14.53

Note that an old through-pillar seatbelt anchorage installation that was carried out (retrospectively as a mandatory requirement under the then Ministry of Transport legislation) during the 1970s or '80s is not required to be LVV certified, and is not expected to meet these requirements if present on a vehicle that is being LVV certified today for other modifications.



GW diagram

Diagram 14.14 Through-pillar upper seatbelt anchorage systems

Seatbelt anchorage support frames:

14.54 Seatbelt anchorage support frame design

14.54.1

A support frame may be used for the attachment of an upper seatbelt anchorage in a low volume vehicle, provided that the support frame incorporates: (see Diagram 14.15)

(a) a main hoop made from a minimum of 38 mm x 2.5 mm (1 ½" x 3/32") wall thickness mild steel tubing; and

(b) diagonal bracing on each side of the main hoop made from a minimum of 38 mm x 2.5 mm (1 ½" x 3/32") wall thickness mild steel tubing, that:

(i) is positioned at a maximum angle from the main hoop of 70 degrees; and

(ii) contains the least amount of change in direction within any bends throughout its length as is practically achievable;

and

14.54

The seatbelt anchorage support frame design specified in 14.54.1 is aimed at providing a simple solution for those vehicles which do not have a steel body structure from which to attach an upper seatbelt anchorage, along with whatever reinforcement system is needed.

Types of vehicles for which this support frame design is intended are fibreglass bodies such as coupes, sedans, pick-ups, and roadsters, that don't have integral steel framing bonded directly to the body.

Typical early steel body structures can be used without this support frame design without the need for any verification.

14.54.1

Note that this specification does not necessarily comply with MotorSport New Zealand's roll-cage rules, or NZ Drag Racing Association rules. This needs to be considered if the vehicle is intended to be used for motor-sport or drag racing also.

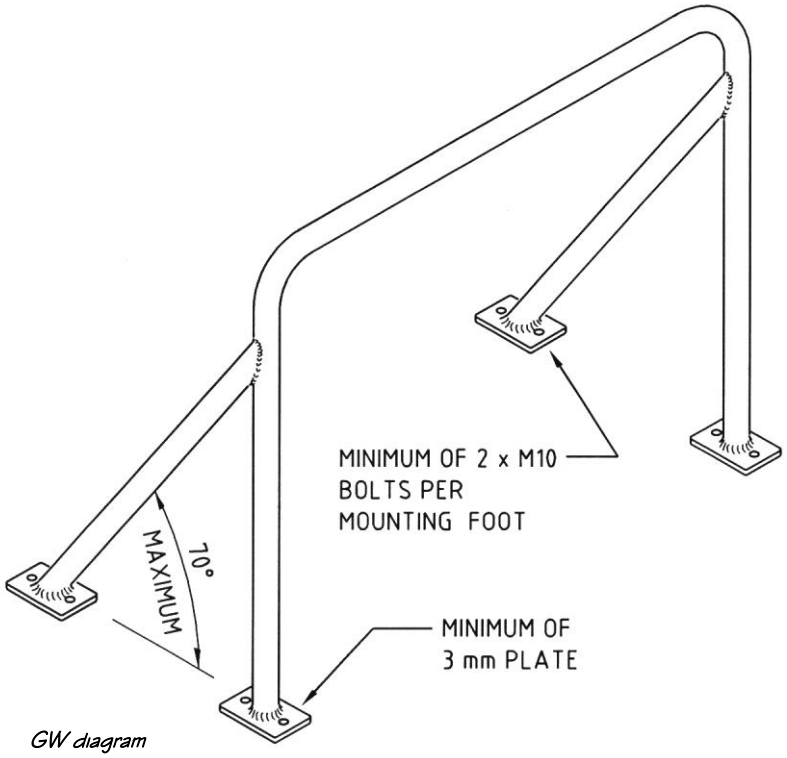
14.54.1(b)

Diagonal bracing can go either forward or rearward.

(c) incorporates a load-spreading foot, welded to the bottom of each support frame main hoop and diagonal brace section where it is positioned against the body structure, which is attached to the vehicle structure by either: (see Diagrams 14.16 and 14.17)

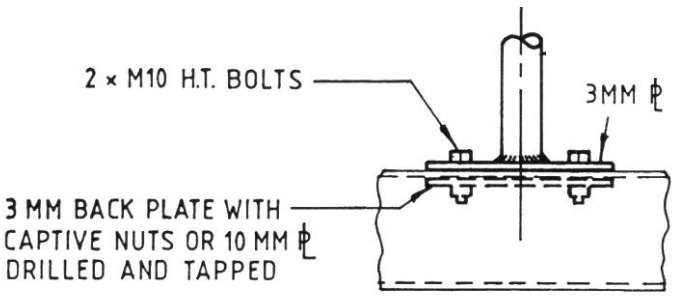
(i) not less than two 10 mm (3/8") fasteners with panel washers on the underside of the structure; or

(ii) welding to the vehicle structure around the circumference of each support frame foot.



GW diagram

Diagram 14.15 Seatbelt anchorage support frame design



GW diagram

Diagram 14.16 Support frame attachment for body/chassis vehicles

14.54.1(a) and (b)

Chrome-moly or stainless steel may be allowed, provided that the material provider or a suitably qualified expert can prove that the material strength is at least equivalent to the material specified in 14.54.1(a) or (b).

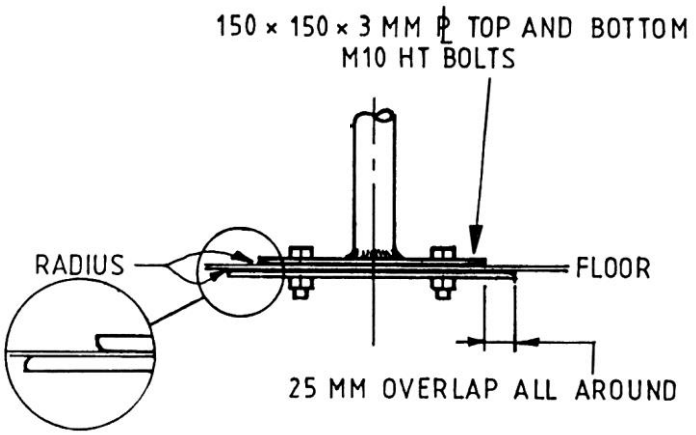
The LVV Certifier may elect to have the TAC independently verify documentation used to support that an alternative material is of equivalent strength.

14.54.1(c)

Note that both MotorSport NZ and NZ Drag Racing Association rules require a higher specification for fixing of feet to the vehicle structure than that specified here.

Diagram 14.16

As an alternative to washers, an under-floor mounting plate can be used.



GW diagram

Diagram 14.17 Support frame attachment for unitary constructed vehicles

Diagram 14.17

As an alternative to washers, an under-floor mounting plate can be used.

14.55 Seatbelt anchorage positioning on support frames

14.55

14.55.1

An upper seatbelt anchorage in a support frame in a low volume vehicle, may be a boss made from solid mild steel material of not less than 19 mm (3/4") diameter, drilled and tapped to accept a fastener specified in 14.41.1, having a thread depth of not less than 9.5 mm (3/8"). (see Diagram 14.18)

14.55.2

An upper seatbelt anchorage boss for a support frame in a low volume vehicle, as specified in 14.55.1, must be: (see Diagram 14.18)

(a) mounted in an east-west position to the longitudinal centre-line of the vehicle; and

(b) fully welded at both ends of the boss to the support frame; and

(c) positioned no further above the intersection point of the diagonal brace and the main hoop than:

(i) in the case of 38 mm (1 ½") tubing, 100 mm (4"); and

(ii) in the case of 44.5 mm (1 ¾") tubing, 150 mm (6"); and

(iii) in the case of 57 mm (2 ½") tubing, 200 mm (8").

A lug and boss assembly for a seatbelt anchorage could be successfully used on a support frame from a strength point of view (assuming the direction of pull was correct), however such anchorages (dependent on location and orientation) could introduce interior impact problems, and in many cases wouldn't be allowed because of that. For this reason, if using a lug instead of a boss, ensure that the relevant specifications provided in 14.61 and 14.62 are followed, and be sure that no interior impact problems are introduced as a result.

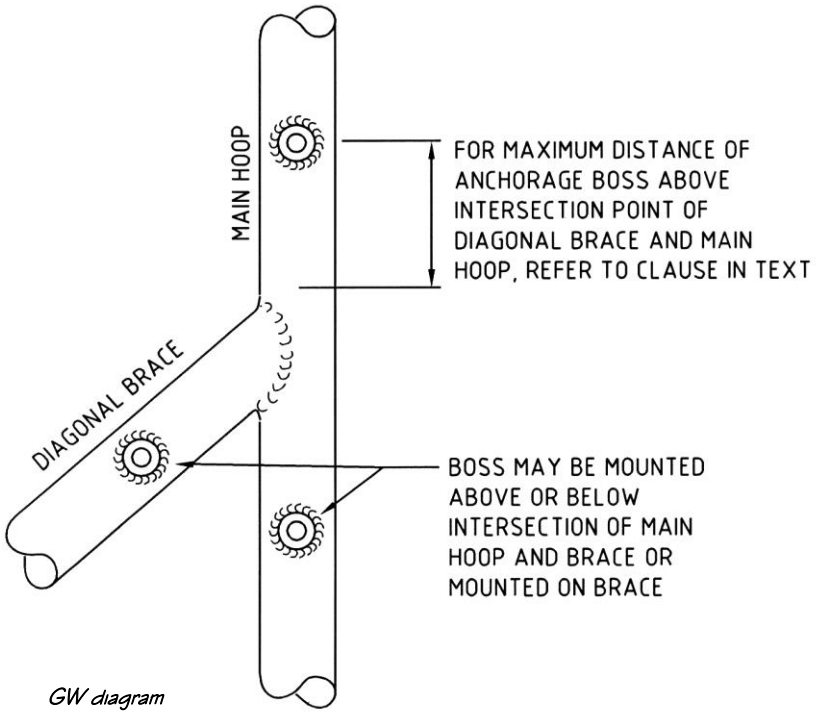


Diagram 14.18 Seatbelt anchorage boss in a support frame

Diagram 14.18

A gusset could be used to shift the effective intersection point between the main hoop and the diagonal brace.

14.56 Full harness seatbelt anchorage positioning on support frames

14.56.1

A low volume vehicle may use a bar that spans the width of the vehicle at the rear, to support two sets of full harness seatbelts, provided that:

(a) the bar used is mild steel tubing of not less than 38 mm x 2.5 mm (1 ½" x 3/32"); and

(b) fully welded at each end to either a support frame, or a substantial part of the vehicle structure; and

(c) some means is provided to prevent the seatbelt straps from sliding inward from their respective positions.

14.56.1

A support bar that spans the rear strut towers is common practice in motor-sport vehicles, particularly rally cars where a full harness is provided for both front seat occupants. This could also apply to a 2-seater sports car without a roll-bar or roll-cage, using a support frame specifically for the upper seatbelt anchorage attachment.

14.56.1 (a)

Chrome-moly or stainless steel may be allowed, provided that the material provider or a suitably qualified expert can prove that the material strength is at least equivalent to the material specified in 14.56.1(a).

Seatbelt anchorages into chassis rails & cross-members:

14.57 Chassis cross-members used to attach seatbelt anchorages

14.57.1

A set of inner and outer lower seatbelt anchorages for two occupants, (four seatbelt anchorages) may be attached to an unsupported cross-member that spans the chassis rails in a low volume vehicle, provided that: (see Diagram 14.19)

(a) the cross-member is fully welded to the chassis rail at each end; and

(b) the cross-member is made from a minimum of 50 mm x 50 mm x 3 mm (2" x 2" x 1/8") rectangular hollow section mild steel, or in the case of round tube, 60.3 mm x 3.6 mm (2 1/2" x 9/64") mild steel tubing; and

(c) in the case of where the span between the chassis rails is greater than 900 mm (37"), gussets made from 3 mm (1/8") mild steel are added to the front and rear of each join.

14.57.1

This specification differs dramatically from that in the original NZHRA Code of Construction Manual. In the original manual, additional diagonal support members were required, however, physical testing, supported by more calculation work, has shown that these additional diagonal braces are unnecessary.

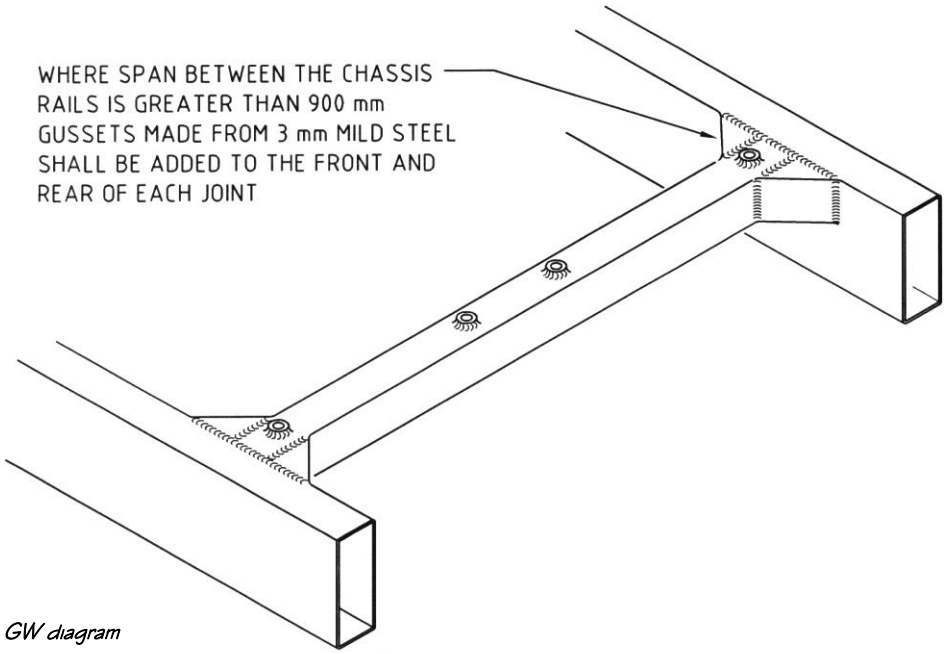


Diagram 14.19 Chassis cross-member used for seatbelt anchorages

14.57.2

A set of inner and outer lower seatbelt anchorages for three occupants, (six seatbelt anchorages) may be attached to an unsupported cross-member that spans the chassis rails in a low volume vehicle, provided that: (see Diagram 14.19)

(a) the cross-member is fully welded to the chassis rail at each end; and

(b) the cross-member is made from a minimum of 65 mm x 65 mm x 3 mm (2 ¾" x 2 ¾" x 1/8") rectangular hollow section mild steel, or in the case of round tube, 73 mm x 5.16 mm (3" x 13/64") mild steel tubing; and

(c) in the case of where the span between the chassis rails is greater than 900 mm (37"), gussets made from 3 mm (1/8") mild steel are added to both sides of each join.

14.57.2

If any other method or material specification is used, additional reinforcement must be provided via the interlinking of additional cross-members.

14.58 Seatbelt anchorage tapping plates inside chassis rails & cross-members

14.58.1

A seatbelt anchorage tapping plate may be welded to the inside of a channel-section or RHS chassis rail or cross-member in a low volume vehicle, provided that: (see Diagram 14.20)

(a) the tapping plate is made from a mild steel material that is not less than 50 mm x 20 mm (2" x 13/16"), and not less than 9.5 mm (3/8") thick; and

(b) the tapping plate is drilled and tapped to accept a fastener specified in 14.41.1; and

(c) the tapping plate is permanently attached to the chassis rail or cross-member by stitch-welding or plug-welding.

14.58.1

A seatbelt anchorage tapping plate can, if desired, also serve as a body mount as well as a seatbelt anchorage mount.

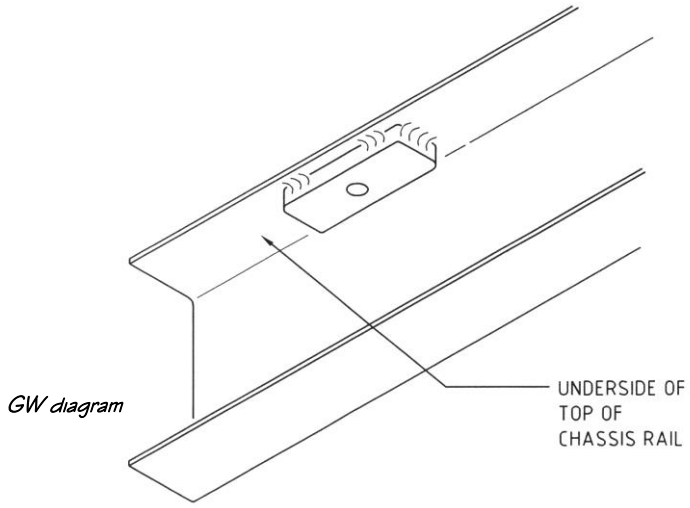


Diagram 14.20 Seatbelt anchorage tapping plates inside rail or x-member

14.59 Seatbelt anchorage tapping plates on top of chassis rails & cross-members

14.59.1

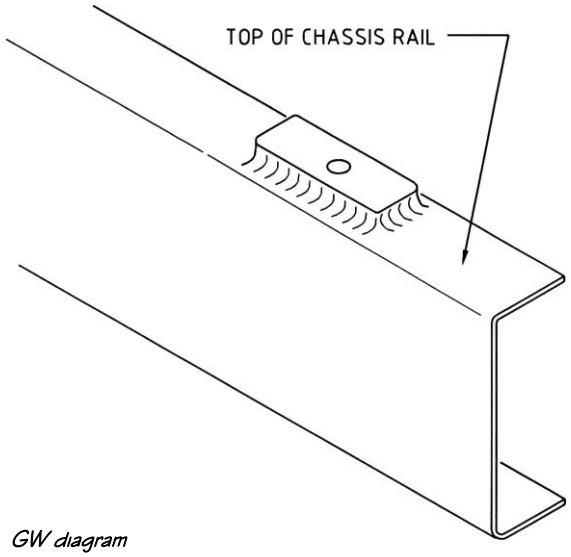
A seatbelt anchorage tapping plate may be welded on top of a channel-section or RHS chassis rail or cross-member in a low volume vehicle, provided that: (see Diagram 14.21)

(a) the chassis rail or cross-member is made from not less than 2.5 mm (3/32") wall thickness material; and

(b) the tapping plate is made from a mild steel material that is not less than 50 mm x 20 mm (2" x 13/16"), and not less than 9.5 mm (3/8") thick; and

(c) the tapping plate is drilled and tapped to accept a fastener specified in 14.41.1; and

(d) the tapping plate is fully welded to the chassis or cross-member around its total perimeter.



GW diagram

Diagram 14.21 Seatbelt anchorage tapping plate on rail or x-member

14.59.1

The seatbelt anchorage hole should be drilled and tapped through the chassis rail (or X-member) also, so that a combined threaded depth of around 12 mm (1/2") is achieved. This method also ensures that a 'blind' hole is avoided for the fastener to bottom out on.

A seatbelt anchorage tapping plate can, if desired, also serve as a body mount as well as a seatbelt anchorage mount.

14.60 Seatbelt anchorage bosses directly into chassis rails & cross-members

14.60.1

A seatbelt anchorage boss may be welded directly onto either the top or the bottom of a channel-section or RHS chassis rail or cross-member in a low volume vehicle, provided that: (see Diagram 14.22)

(a) the chassis rail or cross-member is made from 2.5 mm (3/32") or greater wall thickness material; and

(b) the boss is made from a mild steel material with a diameter of 19 mm (3/4") mm, and not less than 9.5 mm (3/8") thick; and

(c) the boss is drilled and tapped to accept a fastener specified in 14.41.1; and

(d) the boss is fully welded to the chassis or cross-member around its total circumference.

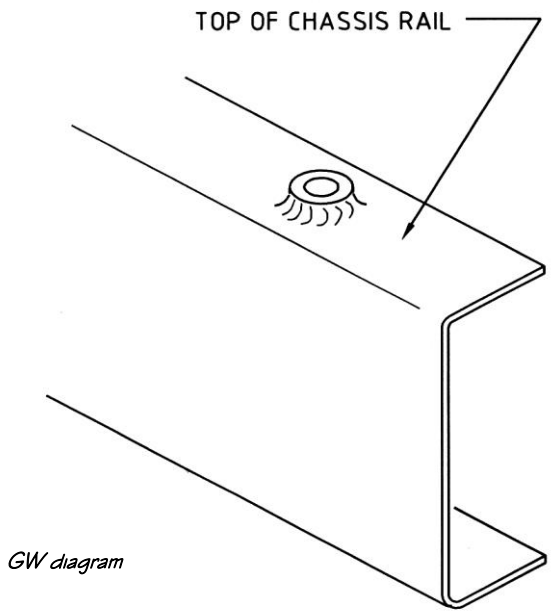


Diagram 14.22 Seatbelt anchorage boss on chassis rail or cross-member

14.60.1

The seatbelt anchorage hole should be drilled and tapped through the chassis rail (or X-member) also, so that a combined threaded depth of around 12 mm (1/2") is achieved. This method also ensures that a 'blind' hole is avoided for the fastener to bottom out on.

A seatbelt anchorage boss can, if desired, also serve as a body mount as well as a seatbelt anchorage mount.

Seatbelt anchorage lugs onto chassis rails & cross-members:

14.61 Chassis rail & cross-member lug and boss specification

14.61.1

A lug and boss assembly may be used to attach a seatbelt anchorage to a chassis rail or cross-member in a low volume vehicle by, provided that:

(a) the lug is made from 50 mm x 6 mm (2" x1/4") thick mild steel material; and

(b) the boss is made from a mild steel material with a diameter of 19 mm (3/4") mm, and not less than 9.5 mm (3/8") thick; and

(c) the boss is drilled and tapped right through to accept a fastener specified in 14.41.1; and

(d) the boss is fully welded to the lug around its total circumference.

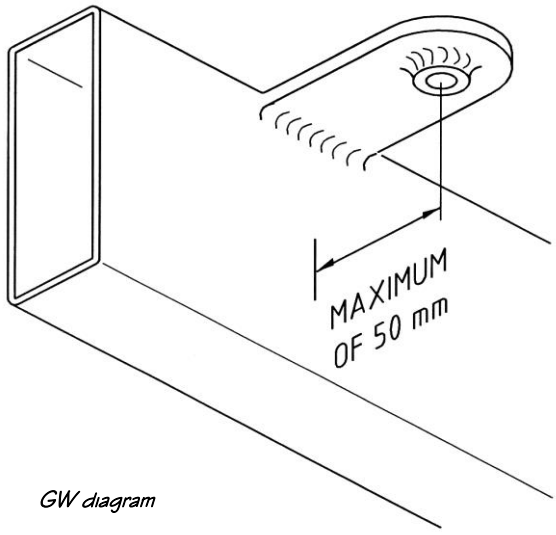
14.62 Lug and boss assemblies into chassis rails & cross-members

14.62.1

A seatbelt anchorage lug and boss assembly, as specified in 14.61.1, may be attached to a chassis rail or cross-member in a low volume vehicle without any additional support or gusseting, provided that: (see Diagram 14.23)

(a) the boss centre is positioned within 50 mm (2") of the chassis rail or cross-member; and

(b) the chassis rail or cross-member has a wall thickness of 3.0 mm (1/8") or more.



GW diagram

Diagram 14.23 Lug and boss assembly

14.62.2

A seatbelt anchorage lug and boss assembly, as specified in 14.61.1, may be attached to a chassis rail or cross-member in a low volume vehicle with the boss centre positioned within 75 mm (3") of the chassis rail or cross-member, provided that: (see Diagram 14.24)

14.62.2

On 3 mm (1/8") or heavier rails or members, the lug can be positioned anywhere within the depth of the rail or member, and the gusset spans the area above or below the lug back to the rail or member.

(a) the chassis rail or cross-member has a wall thickness of 3.0 mm (1/8") or more; and

(b) a 3 mm (1/8") vertical gusset extends from the lug to either the top or the bottom of the chassis rail or cross-member, depending on where within the depth of the chassis or cross-member the lug is positioned.

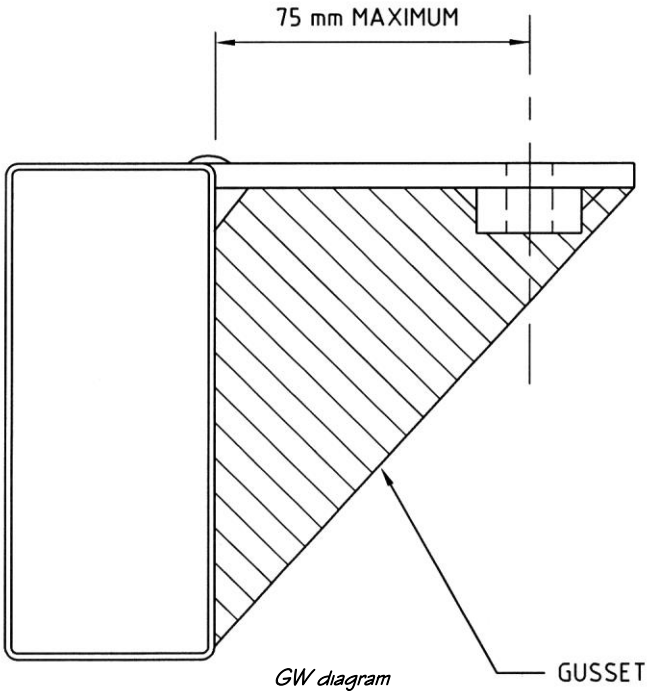


Diagram 14.24 Lug and boss assembly attachment to heavy wall section

14.62.3

A seatbelt anchorage lug and boss assembly, as specified in 14.61.1, may be attached to a chassis rail or cross-member in a low volume vehicle that has a wall thickness of less than 3.0 mm (1/8"), provided that: (see Diagram 14.25)

(a) the boss centre is positioned within 50 mm (2") of the chassis rail or cross-member; and

(b) the lug and boss assembly is positioned centrally within the depth of the chassis rail or cross-member, and fully welded to the chassis rail or cross-member; and

(c) a 3 mm (1/8") vertical gusset extends from the lug to the top and bottom of the chassis rail or cross-member.

14.62.3

On lighter than 3 mm (1/8") rails or members, the lug must be positioned centrally within the depth of the rail or member, and a gusset must span the area above and below the lug back to the rail or member.

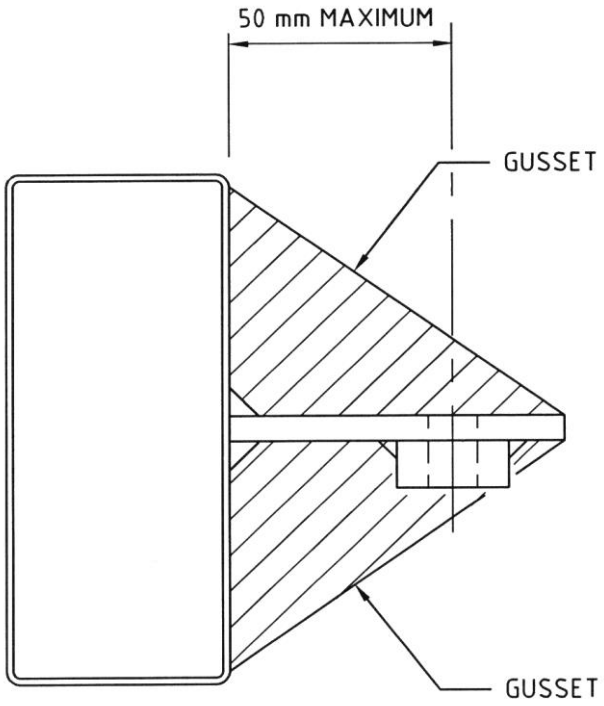


Diagram 14.25 Lug and boss attachment to light-to-medium wall section

14.63 Lug and boss assemblies onto space-frame chassis

14.63.1

A seatbelt anchorage lug and boss assembly, as specified in 14.61.1, may be attached to a section of light-wall space-frame chassis in a low volume vehicle, provided that: (see Diagram 14.26)

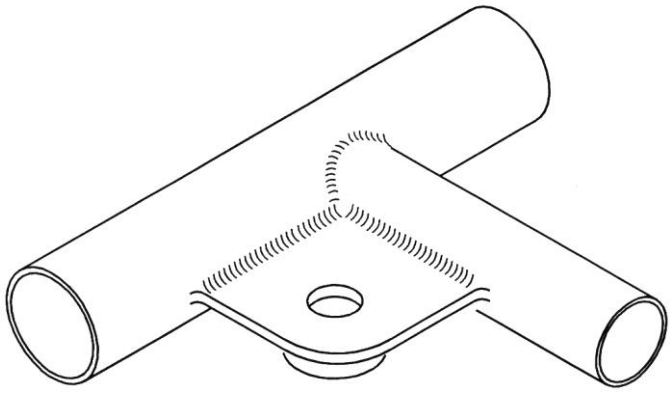
(a) the material specification for the lug is reduced to 50 mm x 3 mm (2" x 1/8"); and

(b) the lug and boss assembly is always positioned at the intersection of two or more of the space-frame chassis tubes; and

(c) gusseting is incorporated within the space-frame chassis tubes if the direction of load is not on the same plane as the lug and boss assembly.

14.63.1

As an alternative to 14.63, a seatbelt anchorage can be mounted to a space-frame chassis via the use of a boss mounted through a tube, provided that the boss is positioned at the intersection of two or more of the space-frame tubes.



GW diagram

Diagram 14.26 Lug and boss assembly to space-frame chassis

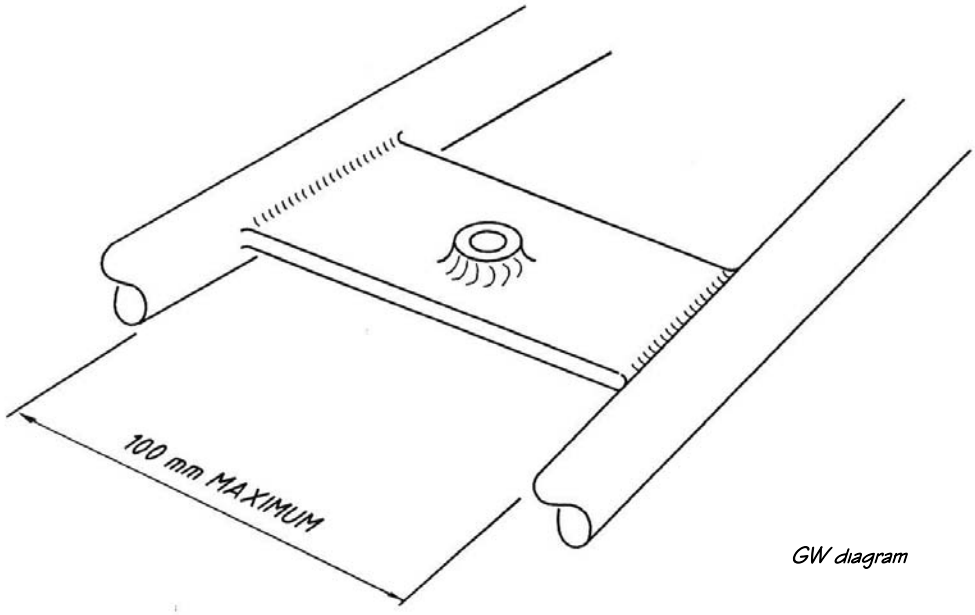
14.63.2

A seatbelt anchorage lug and boss assembly, as specified in 14.61.1, may span two tubes in a light-wall space-frame chassis in a low volume vehicle, provided that: (see Diagram 14.27)

(a) the material specification for the lug is reduced to 50 mm x 3 mm (2″ x 1/8″); and

(b) the total span between the two tubes does not exceed 100 mm (4″); and

(c) gusseting is incorporated if the direction of load is not on the same plane as the lug and boss assembly.



GW diagram

Diagram 14.27 Lug and boss assembly to space-frame chassis

Seatbelt anchorages into rear shelves:

14.64 Rear shelf reinforcement for upper seatbelt anchorages

14.64.1

Where an upper seatbelt anchorage is positioned onto a rear shelf of a low volume vehicle:

(a) the rear shelf must:

(i) be of such a shape, width, design, and material specification so as to be at least as strong as a rear shelf which a high volume vehicle manufacturer installs seatbelt anchorages into as original equipment; and

(ii) be supported at each side by a load-bearing structural member or section of the vehicle;

and

(b) the upper seatbelt anchorages fitted to the shelf must either:

(i) in the case of two outer upper seatbelt anchorages attached to the rear shelf, be attached within 100 mm (4") of a load-bearing structural member or section of the vehicle; or

(ii) in the case of a third upper seatbelt anchorage attached to the rear shelf provided for a centre seating position, that shelf must be suitably reinforced in order to withstand the loads that could be applied by the centre upper seatbelt.

14.64.1(a)(i)

A rear shelf can be reinforced with RHS or similar, stitch-welded all along the rear shelf, and fully welded to a structural part of the vehicle at each outside end.

14.64.1(b)(ii)

The type of reinforcement necessary for a third upper anchorage would be a section of 40 x 40 x 3 mm (1 ¾" x 1 ¾" x 1/8") top hat section or similar, stitch-welded all along the rear shelf, and fully welded to a structural part of the vehicle at each outside end.

Seatbelt anchorages into composite material:

14.65 Seatbelt anchorages into composite material

14.65.1

Where no steel structure exists within the permitted area for an upper seatbelt anchorage in a low volume vehicle, an upper seatbelt anchorage may be fitted into fibre-glass or other composite material, only provided that:

(a) an individual application is approved in writing by the Technical Advisory Committee, on a case-by-case basis, after having been satisfied by documented evidence, which may require test results, that the loadings specified within LVV Standard 175-00 (Seatbelt Anchorages) can be met; and

(b) the person carrying out the composite lay-up work has the appropriate level of expertise to be involved in this area of work.

Other seatbelt anchorage requirements:

14.66 Seatbelt anchorage situations not covered in this chapter

14.66.1

14.66.1

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

In addition to the requirements specified in this Chapter, the applicable requirements of LVVTA LVV Standard 175-00 (Seatbelt Anchorages) must be met in the case of:

(a) a seatbelt anchorage which is attached to the side-wall of a vehicle; or

(b) a vehicle that has specialised seatbelts for a person with a disability; or

(c) a vehicle that is fitted with a quick-release seatbelt anchorage; or

(d) where two seatbelts are attached to one seatbelt anchorage; or

(e) where seatbelts attach to an area where there is a false floor between the seatbelts and the vehicle floor; or

(f) where the permitted area for a seatbelt anchorage is over glazing, and a window bar or cant rail dropper is required.

Exclusions:

14.67 Upper seatbelt anchorages in older vehicles

14.67.1

A low volume vehicle is not required to be fitted with upper seatbelt anchorages if:

(a) the vehicle was manufactured before 1 November 1979; and

(b) was never originally designed by the vehicle manufacturer to be fitted with upper seatbelt anchorages; and

(c) either:

(i) no fixed roof exists within which to position an upper seatbelt anchorage within the permitted area for an upper seatbelt anchorage specified in 14.36 to 14.38; or

(ii) the B-pillar is of such dimensions, or of such a shape, so as to preclude the installation of a doubler plate assembly specified in 14.44 to 14.48 within the permitted area for an seatbelt anchorage specified in 14.36 to 14.38.

14.67.1

This exclusion is intended to apply primarily to pillarless classic motor vehicles of the 1950s and 60s.

Useful information

Seatbelt anchorage loadings

Some of the requirements in this chapter, particularly those for seatbelt anchorages, might look like overkill, but it's easy to under-estimate the forces at work during an impact when gravity takes hold of your body.

If you're an average healthy-sized 100 kg (220 lb) Kiwi bloke, the load your body-weight imposes on your seatbelt and seatbelt anchorages in an impact isn't 100 kg. During a sudden stop, inertia dictates that your body wants to keep going forward – just like if there was something loose on the back seat. In a 20 G impact (a 20G crash is considered survivable if luck is on your side), that inertia causes your body to effectively weigh 20 times more than it actually does, in the direction of the impact.

So, what the seatbelt and the combined seatbelt anchorages have to restrain, is not 100 kgs (220 lbs), but 100 kgs x 20, which equals 2000 kgs (4400 lbs).

When you think you've got your seatbelt anchorage system nutted out, ask yourself this hypothetical question – if I could somehow secure my car 9 metres (30 feet) up against the side of a building, facing nose down, and I could attach a set of strops or chains to one person's seatbelt anchorages, and then suspend a Holden Commodore from that one person's set of seatbelt anchorages, would I let my kids stand under that Commodore? That's obviously an over-simplistic way of looking at it, but those are the kind of massive loads at stake.

Seatbelts in old cars

The law of the land has always said that a vehicle manufactured before 1955 doesn't need to have seatbelts. The car hobby has ridden on the shirt-tail of this sweeping statement for many years, which when written, never really considered a Pre-'55 vehicle that's been substantially modified in the performance department.

If it came to a debate, it would be hard for the LVVTA or NZHRA to hold its hand on its heart, and say, from the point of view of a responsible organisation, that a 1928 Model-A Coupe with an IFS, IRS, R&P, TPI OHV engine, 700R overdrive auto trans, and big brakes, shouldn't have to be fitted with seatbelts because 'its an old car'. Why shouldn't it? Because the car's too rare to modify? Yeah, right! Because it's too difficult? C'mon! Do you really believe that?

The time has come to take a deep breath, and as responsible and sensible vehicle enthusiasts, accept that we need to engineer in some seatbelt anchorages as part of the project, even in our old steel cars. Most people involved in hot rodding, sports cars, and kit cars tend to be older these days, and are already putting in seatbelts because it's just plain dumb not to, so this new rule is only going to hurt a few. If you're one of those few, I'll promise you this – complying with this new rule won't hurt as much as getting in a head-on without lap and diagonal seatbelt.

Note that the requirement for lap and diagonal seatbelt in old modified production cars – as required by 14.31.1(b) - only applies to vehicles that have been significantly modified for substantial performance gains, to the extent that the car's driving characteristics are more like that of a modern car. Here's the basic intention: The Model-A Coupe with the hotted side-valve V8, dropped I-beam, and reversed Merc rims is not going to be required to be fitted with seatbelts, as whilst its been modified, the modifications aren't such that the car's old-timey driving characteristics have disappeared. Similarly, it is not the intention of the requirement to say that because someone has replaced the original 6-cylinder engine in their '59 Chev Impala with a V8 engine, the vehicle now requires lap and diagonal seatbelts.

This requirement applies where there has been a substantial increase in power, and where there has been a significant redesign of the vehicle's mechanicals. 'Substantial' horsepower gains can be loosely defined as where a vehicle's horsepower output has doubled or more. A 'significant redesign' of the vehicle's mechanicals can be loosely defined as where the suspension and steering configuration, and braking type have all been completely changed.

For example, the mechanicals of a 289-powered '48 Ford Sedan with disc brakes adapted, an F100 steering box fitted, and telescopic shocks fitted, haven't undergone a 'significant redesign'. That's just a few enhancements. A significant redesign would be where custom cross-members, an IFS, power rack, late-model column, and vented discs have been engineered into the '47 Ford.

Everyone involved in the LVV certification system is aware that this whole issue will be quite subjective on the odd occasion, so some vehicles will need to be considered on a case-by-case basis, and in these cases the LVV Certifier will talk to LVVTA to get a ruling.

Also, while lap and diagonal seatbelts are only mandated for the front outer seating positions, there's no better advice in this Car Construction Manual than to fit lap and diagonal seatbelts everywhere that you can. If you're building a sedan, then fit them in the rear outer seating positions, and even in the center rear seating position if you can – some older and wiser hot rodders have been doing this for years now.

Upper seatbelt anchorage capping plates for pillar reinforcement

Some early cars, pre-1940s sedans in particular, were never originally designed to have seatbelts fitted, and their B-pillars in particular are often not up to the job. In most cases, the B-pillar itself has plenty of strength – certainly enough for an upper seatbelt anchorage - but the problem lies in the way in which the B-pillar is attached to the roof and the floor or sill.

Upper and lower 'capping plates' need to be fitted at the attachment point of the B-pillar to the roof and floor or sill to strengthen those areas. The top capping plate can, if desired, extend down the pillar to provide the inner doubler plate for the seatbelt anchorage itself.

Existing timber framing may be left inside the B-pillars for added strength, or it can be removed and replaced with RHS framing, as most car builders tend to do as part of the overall repair and stiffening-up process.

Use Diagrams 14.28 to 14.30 as a guide to help you design your capping plates.

The upper seatbelt anchorage capping plates (as shown in Diagram 14.28) can be integrated within the steel inner framing as shown in diagram 14.30.

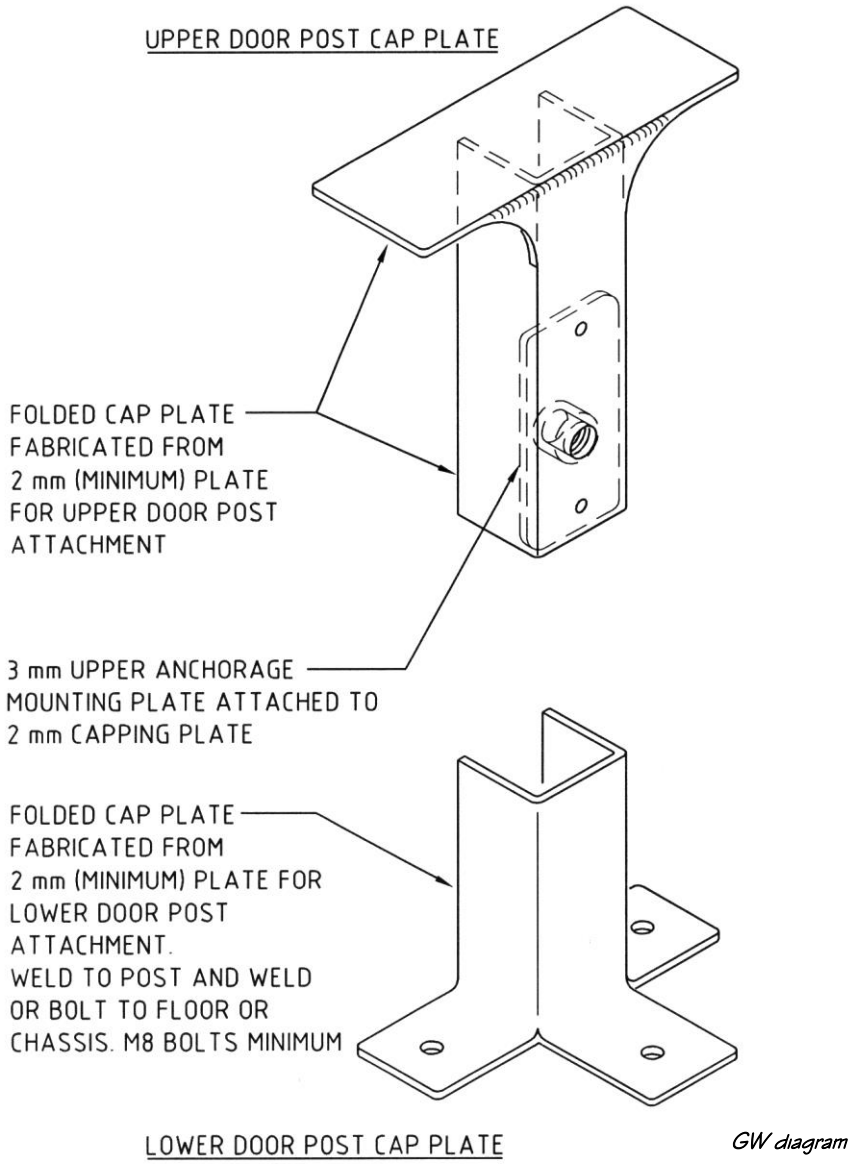


Diagram 14.28 Capping plate design

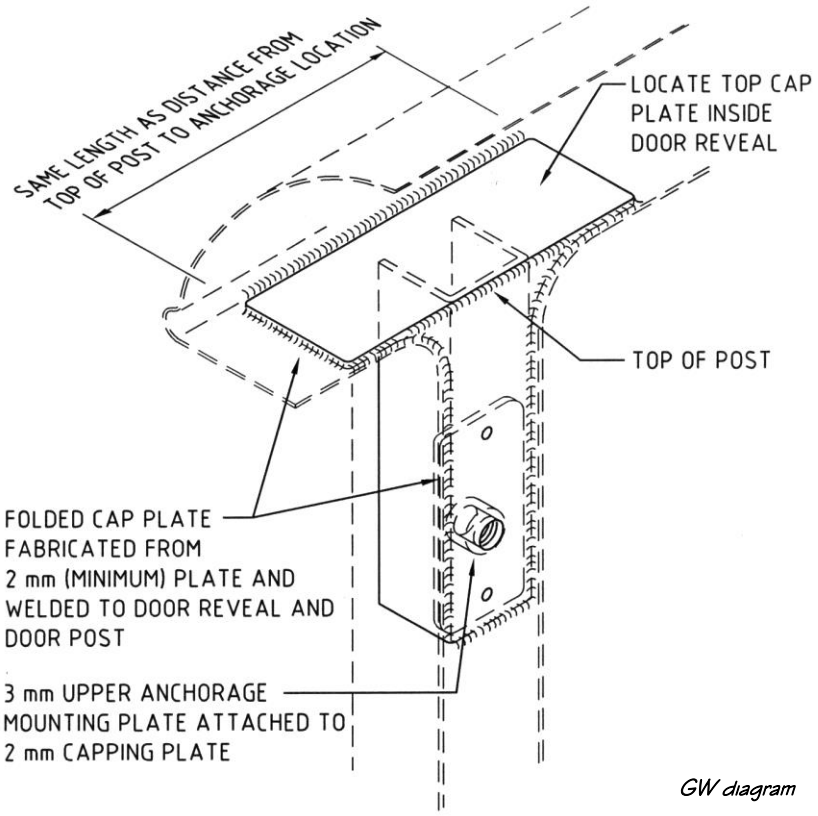


Diagram 14.29 Capping plate attachment into steel body

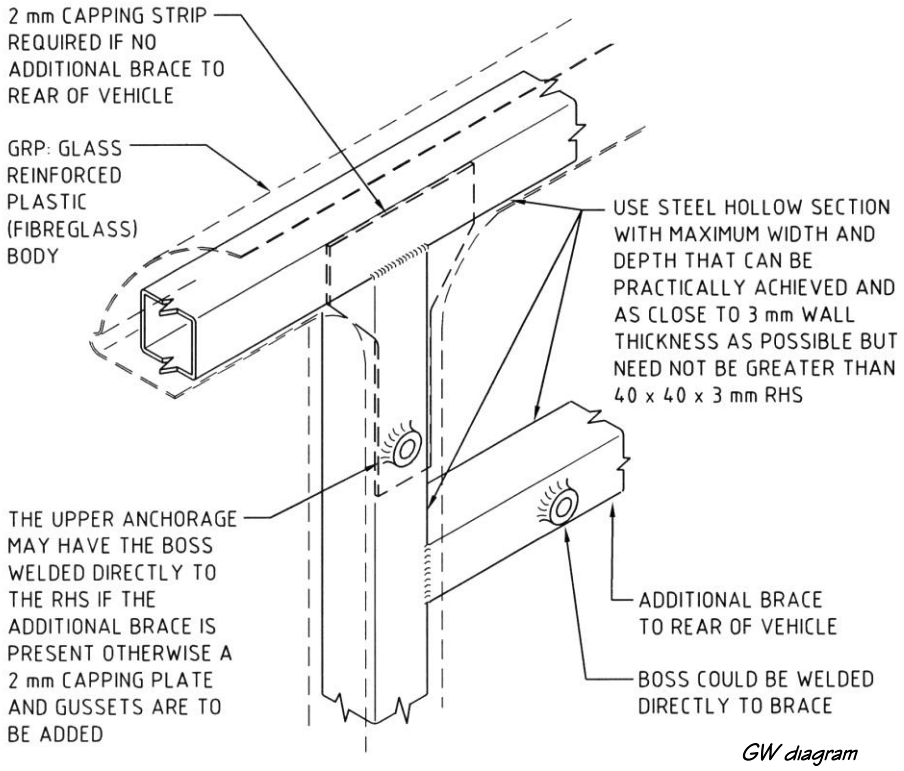


Diagram 14.30 Capping plate attachment into fibreglass body

Reinforcing old and old-style bodies with steel framing

The basic rule of thumb with installing steel framing into any body, whether steel or fibre-glass, is to use the largest material possible (both width and depth) within the available apertures, with a wall thickness as close to 3.0 mm (1/8") as practicable. Having said that, there would never be any need to use a material section in any kind of hobby car body any larger than 40 x 40 x 3 mm (1 ¾ x 1 ¾ x 1/8") RHS.

You will see that in Diagrams 14.31 and 14.32, there are notes which refer to both fibre-glass and steel body reinforcement, however, their actual needs are quite different. Generally speaking, steel bodies just need some sort of reinforcement to ensure that the pillars become sufficiently strong to withstand seatbelt anchorage loadings, whereas fiberglass bodies need full RHS reinforcement to provide stiffness, general strength, and roll-over integrity.

Steel framing for steel-bodied cars

Steel bodies obviously start off with a steel door pillar. The main concern with steel bodies is with reinforcing the top and bottom connections of the B-pillar (and in the case of a 4-door sedan the C-pillar). This is because the OE connections to the roof and the sill are very weak in some early model cars, and we have to ensure that, should the worst happen and major seatbelt anchorage loadings are applied to the pillar, the pillar won't separate from the rest of the body.

All that is required in this case is the 'capping plate' pillar connection reinforcement shown in Diagram 14.28. While you're at it, there are lots of good reasons to reinforce the pillar internally with RHS, but that's certainly not mandatory. If you are going to do this, go for the largest section possible that will fit in the cavity, and keep the wall thickness as close to 3.0 mm (1/8") as practicable.

Steel framing for fibre-glass bodied cars

For fibre-glass bodied cars, steel inner framing will need to be used for a variety of functions, from providing roll-over protection, to hanging doors and supporting the steering column, to supporting upper seatbelt anchorages, so use heavy-wall (as close to 3 mm [1/8"] wall thickness as possible) steel framing. The material should be as large a section as will fit within the recesses of the body, generally as close to 38 x 38 mm (1 ½ x 1 ½") section as can be fitted, particularly above door reveals, and in A, B, and C-pillars. This framing should be fully welded, and bolted to the chassis.

Reinforcing B-pillars on fibre-glass bodied cars is generally not a problem, mainly because there are no (to our knowledge) 4-door fibre-glass bodies on the market. With 2-door bodies such as coupes, roadsters, and even tudors, even if there isn't enough room in the pillar aperture to install a good sized section of RHS, there's always plenty of space to the rear of the B-pillar to enable the builder to get some rearward bracing in to support it. It's also important to run a beam across the roof between the B-pillars and linking up to the B-pillar reinforcement, to help provide resistance to inward loading for the upper seatbelt anchorages, and to provide roll-over protection.

To give builders an idea of material sizes that should be used, here's a couple of examples of materials used in professionally-manufactured bodies that come fully 'steeled-out'.

A New Zealand-built fibre-glass 1934 3 window coupe incorporates in the A-pillars 20 x 20 x 3 mm (25/32 x 25/32 x 1/8") RHS at the top part of the pillar, then enlarging up to 38 x 38 x 3 mm (1 ½ x 1 ½ x 1/8") in the part of the pillar below the window line; in the B-pillars 38 x 38 x 3 mm (1 ½ x 1 ½ x 1/8"); and in the cant rails 38 x 38 x 3 mm (1 ½ x 1 ½ x 1/8"). The transverse floor strength relies on the chassis. This system is considered ideal and should be used as a guideline.

The 'Deuce Customs' fibre-glass 1934 3 window coupe, as supplied in New Zealand by Tauranga's Rods by Reid is quite light by comparison, however the framing in these bodies has been designed and tested to meet the Australian Design Rules. It incorporates in the A-pillars 25 x 25 x 2.5 mm (1 x 1 3/32") RHS; in the B-pillars 50 x 20 x 2.5 (2 x 2 x 3/32") RHS; and in the cant rails 19 x 19 x 1.6 (3/4 x ¾ x1/16") RHS. The A and B-pillars are welded to a 50 x 20 x 3 (2 x 2 x 1/8") RHS sill which runs from the firewall frame back to the rear wheel arches. The floor pan incorporates a lot of steel tube ranging from 25 x 25 x 1.6 (1 x 1 x 1/16") through to 35 x 19 x 1.6 (1 3/8 x ¾ x 1/16"), made up of transverse floor members with inner longitudinal members welded to these tranverse members.

Without the luxury of full design and testing, a builder should use the biggest materials that he can physically fit within the cavities.

Use Diagrams 14.31 and 14.32 as a guide to help you design your steel framing, which can be used in both fibre-glass and steel-bodied cars.

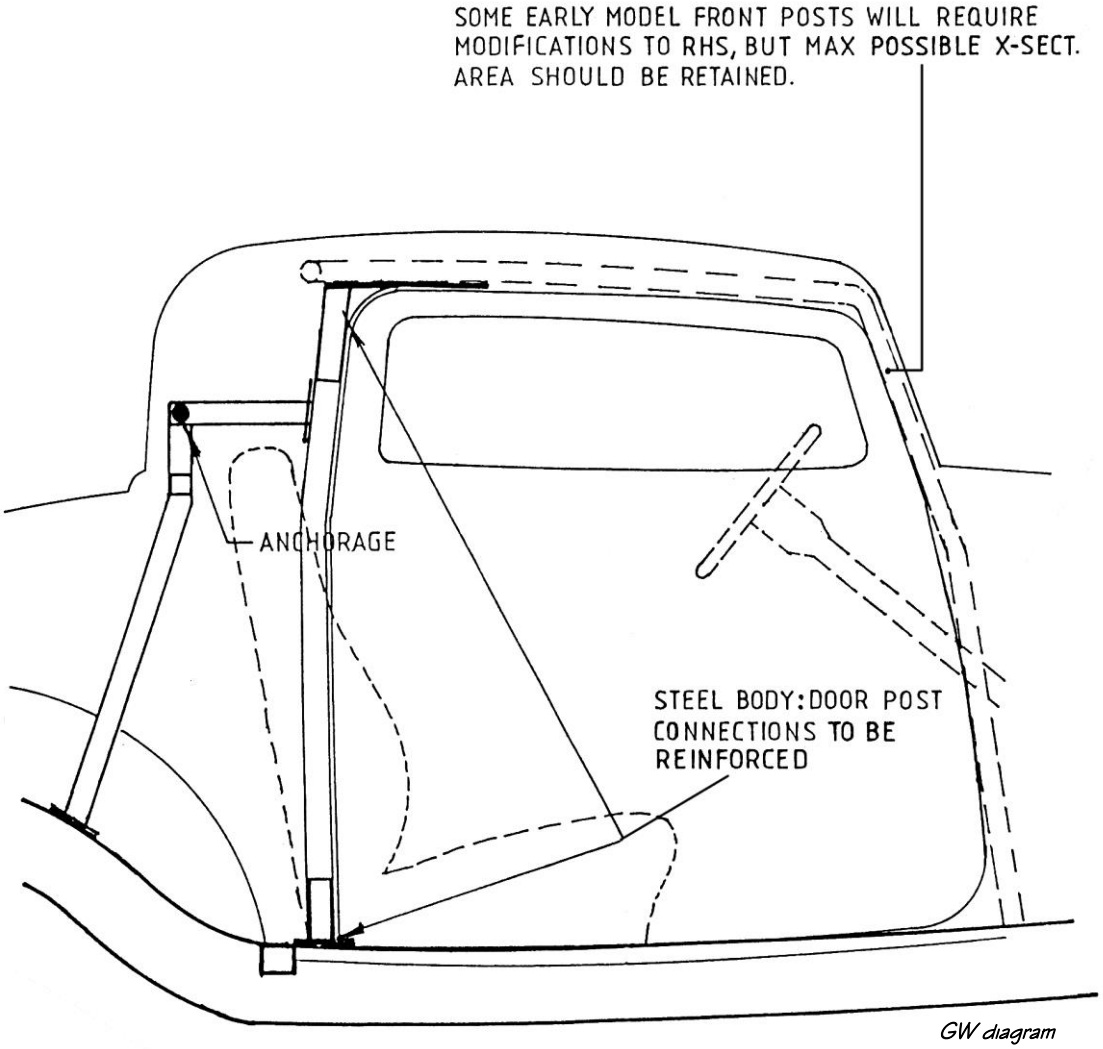


Diagram 14.31 Steel framing in coupe body

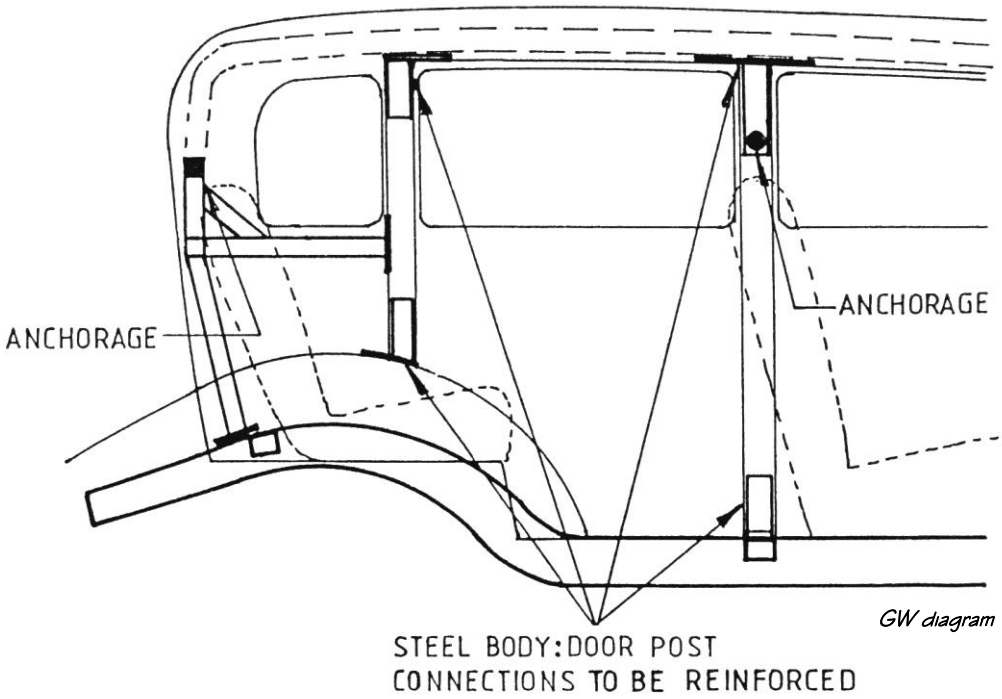


Diagram 14.32 Steel framing in sedan body

Seatbelts in open scratch-built cars

In the past, open vehicles, or to be more precise vehicles with no permanent structure beyond a point 500 mm (20") upward from the intersection of the seat base and the seat back (in other words, no fixed structural roof), didn't have to be fitted with lap and diagonal seatbelts. When the new LVV Standard for Seatbelt Anchorages was developed a few years ago, it was agreed that in the case of a new scratch-built vehicle built after 2003, lap and diagonal seatbelts must be fitted for each front outboard seating position. This sometimes necessitates building in some framing to take the upper anchorages, but within the context of building a car from scratch, it's not a big deal.

Upper seatbelt anchorages in old steel bodies

For upper seatbelt anchorages in 1940s and earlier coupes and roadsters, and1950s and earlier pick-ups, there will usually be some factory structure around the (inside of the) back of the body, close to the area into which the upper anchorages need to go. This structure provides extra strength for the rear and rear side window framing, and can usually provide a base structure from which to add upper anchorages. Roadsters will need new framing built in around the belt-line area.

Get the right help with designing seatbelt anchorages

Because of the high loadings that a seatbelt anchorage might have to withstand, and the importance of it doing its job well if required, it would be well worthwhile getting advice at an early stage from an LVV Certifier who has lots of hands-on experience in both building and LVV certifying scratch-built vehicles. Make it a key discussion point at your chassis inspection.