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NATIONAL CODE OF PRACTICE

STANDARDS BULLETIN VSB 5B
**CONSTRUCTION AND INSTALLATION OF
ADDITIONAL SEATS BY INDIVIDUALS**

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**These Guidelines do not cover administrative requirements imposed by State,
Territory and Federal jurisdictions**

**These National Guidelines are intended to assist individuals who wish to construct and
install an additional seat for their own use and to ensure that the additional seats
constructed and installed by them comply with an acceptable level of occupant protection
and comfort.**

**These guidelines must not be used for the manufacture and installation of seats on a
commercial basis.**

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Scope

These National Guidelines are intended to assist individuals who wish to construct and install an additional seat for their own use and to ensure that the additional seats constructed and installed by them comply with an acceptable level of occupant protection and comfort.

Introduction

These Guidelines must not be used for the manufacture and installation of seats on a commercial basis.

Additional seats installed in new vehicles first offered for sale in Australia must comply with the Australian National Vehicle Standards for new vehicles, known as the Australian Design Rules (ADRs). The ADR which applies specifically to seats is ADR 3/... Seats manufactured for sale to the public for installation in vehicles which have already been registered and used are required to comply with the latest edition of Vehicle Standards Bulletin No 5A (VSB 5A) *National Code of Practice - Commercial Manufacture and Installation of Additional Seats*.

If you intend to produce or install seats on a commercial basis you must comply with either of the above standards as it applies to your intended business.

Registration authorities around Australia have recognised the need for guidelines to assist those individuals who wish to construct and install their own additional seats in vehicles. If these Guidelines are followed carefully the completed installation will be accepted by all State and Territory registering authorities as providing an acceptable level of occupant protection without having to demonstrate compliance with the latest edition of ADR 3/... or VSB 5A.

Methods of construction other than those laid down in these Guidelines may be used provided that engineering evidence is submitted to show that the seats meet the strength requirements of the latest edition of ADR 3/...

Caution

Seats and seat belts play a critical role in occupant protection and personal comfort. The seat and seat belt can be subjected to substantial forces in a crash so they must be carefully designed, constructed and installed to ensure that they will provide adequate protection. If you do not possess the necessary construction and installation skills you should not attempt to construct or install an additional seat.

Passenger vehicles generally provide a higher level of safety than goods carrying vehicles. If a goods carrying vehicle is to be converted to a passenger carrying vehicle by the fitting of additional seats you must provide engineering evidence that the vehicle meets those higher safety standards. You should seek advice from your registering authority if this is the case.

A goods carrying vehicle becomes a passenger carrying vehicle when the total number of seating positions multiplied by 68 kgs is more than half of the vehicle's load carrying capacity.

You should check with your registering authority as to what evidence they require to show you have met these Guidelines.

Applicability

These guidelines are applicable to additional seats for cars, station wagons, vans, utilities, campervans, small buses and light trucks.

The ADR Vehicle Categories for these vehicles are:

- MA - passenger cars;
- MB - forward control passenger vehicles;
- MC - off-road passenger vehicles;
- MD - light omnibus;
- NA - light goods vehicles;
- NB1 - medium goods vehicles up to 4500 kg Gross Vehicle Mass (GVM).

The Vehicle Category is shown on the compliance plate fitted to the vehicle.

General

For the purpose of these Guidelines, additional seats are divided into three categories to allow seats to be designed for occupants of different size and mass. The seat categories are:

- Category 1 -- Seats intended for use by adults;
- Category 2 -- Seats restricted to use by children up to 12 years of age; and
- Category 3 -- Seats restricted to use by children up to 8 years of age.

Category 2 seats may only be installed when it can be demonstrated that the head space and leg space available are only sufficient to accommodate a child up to 12 years of age with a seated height of 780 mm.

Category 3 seats may only be installed when it can be demonstrated that the head space and leg space available are only sufficient to accommodate a child up to 8 years of age with a seated height of 700 mm.

This is to ensure that the possibility of a seat being occupied by a person larger or heavier than the seat is designed to accommodate is reduced to a minimum.

Child restraint anchorages must comply with the requirements of the latest edition of ADR 34/...

Child restraint anchorages must be provided, in accordance with the latest edition of ADR 34/... where an additional seat equipped with an adult seat belt assembly has been fitted.

Engineering Evidence

Where these Guidelines state that engineering evidence is required the evidence must be submitted to the State or Territory Registering Authority in the form of engineering calculation or test results certified by an engineer with experience in structural design, or as otherwise required by the registering authority.

Seat Location Requirements

Careful consideration must be given to the suitability of the vehicle before additional seat(s) are installed.

Aspects that must be considered when assessing the suitability of a vehicle for the installation of additional seats are:

- the space available in the vehicle must be sufficient to accommodate the additional seats and occupants
 - recommendations regarding the space required for additional seats and occupants are set out in [Appendix A](#);
- additional seats should not be installed in the trays of utilities or trucks unless adequate rollover protection is provided
 - fibreglass, plastic and light steel canopies do not provide adequate rollover protection;
- it is recommended that the additional seats not be installed in the vehicle in a location where there is a high probability that the occupant will be injured in a crash
 - for example, there is a high probability that an occupant in a rear facing seat in the rear of a small station wagon would suffer, leg injuries in a rear end collision, because the occupants' legs are located in an area that will crumple as a result of the impact forces;
- additional seats must not impose any loads on existing seats;
- access to and from all seats should be sufficient to allow a person to enter and exit the vehicle, operate door latches, folding seat controls, etc. without assistance;

- the installation of seats in a vehicle's load space is not acceptable where the only access can be obstructed by the load;
- where existing seats are modified to improve access, eg. by installing a folding mechanism, the modifier must demonstrate that the modified seats continue to comply with the latest edition of ADR 3/...;
- fittings such as seat backs should be padded to reduce injury where they could be struck by an occupant's head, arms, legs etc, during an impact; and
- it is recommended that an assessment be made of the effect of the additional seats, head restraints (if fitted), and occupants on rearward visibility
 - additional rear vision mirrors may be required in cases where rearward vision is restricted.

Side-Facing Seats

Although side-facing seats may be fitted, front-facing and rear-facing seats are preferred because they provide a higher level of safety.

Child Restraint Anchor Points

Child restraint anchorages must comply with the requirements of the latest edition of ADR 34/....

Child restraint anchorages must be provided in accordance with the latest edition of ADR 34/.... where an additional seat equipped with an adult seat belt assembly has been fitted.

Child restraint anchorage must not be installed to permit restraining devices such as baby capsules and child seats to be used on rear-facing or side-facing seats.

Relocation of Spare Wheel

Where additional seats are installed in the spare wheel well of the vehicle, provision should be made for relocating and securing the spare wheel.

If the spare wheel is relocated within the vehicle, the spare wheel mounting should be of sufficient strength to withstand a deceleration of 20 times the weight of the spare wheel and its mounting in both the forward and rearward direction.

The spare wheel and its mounting must not cause a hazardous projection for the vehicle's occupants.

Interference with Existing Safety Equipment

The additional seats, spare wheel, etc. must not prevent or restrict the use of existing safety devices such as seat belts and child restraint anchorages, unless complying alternatives are provided.

Note:

Child restraint anchorages are designed to withstand only those loads imposed by correctly fitted child restraints.

Load Restraint

Where additional seats are installed in a vehicle's cargo space, and there is sufficient space remaining behind the seat for cargo to be carried, it is recommended a cargo barrier be installed to restrain the load in a crash.

Labelling of Seats

Category 2 and 3 seats must bear a plate or label made of durable material and fixed in a conspicuous place near the seat. The plate or label must be made of a material which is not easily removed or defaced in normal use.

The plate or label must display the following:

Category 2 seats:

The following warning with letters not less than 5 mm high:

WARNING
THIS SEAT MUST NOT BE USED BY A PERSON
HEAVIER THAN 38 kg OR WITH A
SEATED HEIGHT GREATER THAN 780 mm.

Category 3 seats:

The following warning with letters not less than 5 mm high:

WARNING
THIS SEAT MUST NOT BE USED BY A PERSON
HEAVIER THAN 26 kg OR WITH A
SEATED HEIGHT GREATER THAN 700 mm.

Seating Positions

The number of seating positions is the number of complete multiples of:

- 410 mm for Category 1 seats;
- 300 mm for Category 2 seats; or
- 250 mm for Category 3 seats;

that can be fitted within the maximum effective width of the cushion.

For example, if the maximum effective width of the cushion is 900 mm then two seating positions for Category 1 seats, three seating positions for Category 2 seats or three seating positions for Category 3 seats would be permitted.

Seat Construction and Installation

Seat frames must be constructed so that there are no sharp edges or projections which can cause injury to occupants in an impact.

Seat mounts should be located on areas of the structure that are adequately reinforced to take the loads.

Front-facing Seats

Single seats, seats with two seating positions and seats with three seating positions constructed as shown in Figures [4](#), [5](#) and [6](#) respectively are acceptable.

All connections must be welded around the full section of the tube. Welding should be carried out in accordance with Australian Standard AS1554 Part 1 *Welding of Steel Structures Category SP (Structural Purposes)*, and preferably by a qualified welder.

The seat base, seat back and head restraint, where fitted, must be covered with 10 mm thick structural plywood which is attached to the seat frame with 10 gauge self drilling, self tapping wafer head screws at not more than 200 mm centres.

The edges of the plywood must be trimmed to align with the perimeter of the seat frame

All parts of the seat that could cause injury in an impact should be covered with high density foam. Refer to the Padding section for the specification of a suitable high density foam.

Seat padding and upholstery must be securely attached to the seat frame to prevent movement during impact. Loose cushions must not be used.

Rear-facing Seats

Rear-facing seats may be fitted provided engineering evidence is submitted to show that the seats comply with the strength requirements for rear-facing seats as set out in [Appendix B](#).

Alternative Methods of Construction

Alternative methods of construction may be used provided that engineering evidence is submitted to show that the seats meet the strength requirements of the latest edition of ADR 3/...

Seats from an Existing Vehicle

A seat from another vehicle may be used as an additional seat in another vehicle, eg the bench seat from the front of a sedan may be installed in a cargo van to provide an additional seat.

The seat must be attached to the vehicle with at least the same number and size of fasteners as in the original installation.

Where the seat is installed on a supporting frame to increase the height of the seat above the floor, the supporting frame must be constructed of rectangular hollow section not less than 25 mm x 25 mm x 2 mm. The construction, including bracing, must be as set out in Figures [4](#), [5](#) or [6](#), depending on the number of seating positions provided by the seat.

Seat Belts

New seat belts complying with Australian Standard 2596 (*Seat Belt Assemblies for Motor Vehicles*) should be fitted to all additional seating positions.

A used belt may have damage or wear that is not apparent and may no longer be strong enough to hold its wearer in a crash.

Type of Seat Belts

Some registering authorities may require retractor type (inertia reel) belts to be fitted for all additional outboard seating positions and this should be checked with your local authority before proceeding. In those States or Territories where retractor belts are not mandated it is strongly recommended that they be installed.

Where retractor belts are fitted they must be of the dual sensitive type.

The seat belt manufacturer's fitting instructions must be adhered to when installing a retractor belt to ensure that the belt operates as intended. Typical installation diagrams are shown at [Figure 7](#).

All outboard seating positions must be fitted with lap sash seat belts except:

- where there is no permanent structure, other than the seat, in the shaded area shown in [Figure 8](#); or
- where the seat is designed to provide adjustment for conversion of occupant space to luggage or goods space, and such seating positions are not in the first or second row of seats.

All inboard seating positions must be fitted with at least either a lap belt or a harness belt.

All side-facing seats must be fitted with lap belts only.

Seat belts must be installed so that the buckle is located adjacent to the occupant's hip (not on the abdominal area) and so that the belt adjusting devices are easily accessible.

Seat Belt Anchorages

Seat belt anchorages must be installed to adequately secure the seat belts to the vehicle's structure and to ensure that the seat belt bears on the bony structure of the body. The lap belt should be positioned across the pelvis and not across the abdomen. The sash, if fitted, should be positioned across the shoulder and should not bear on the occupant's neck.

Anchorages must be positioned so that the belt webbing cannot rub against sharp edges or projections and so that the belt assembly can function correctly.

Where retractor belts are being installed the seat belt manufacturer's positioning and fitting instructions must be followed to ensure that the belt operates as intended. Typical installation diagrams are shown at [Figure 7](#).

Seat Belt Anchorage Location

Upper Anchorages

Upper anchorages must be located on a side pillar, on a structural member of the vehicle or on the seat frame, provided engineering evidence is supplied to demonstrate that the seat frame is designed to withstand the seat belt anchorage loads (seats depicted in Figures 4, 5 and 6 are not suitable for mounting upper anchorages on the seat frame), and within the shaded area of Figure 5 with the seat in its rear-most position, if the seat is adjustable. The ideal location is approximately 75 mm above the shoulder and slightly behind the wearer.

Lower Anchorages

The lower anchorages must be on opposite sides of the centreline of the seating position and located within the shaded area as shown in Figure 9.

Because seat belts are generally made to standard lengths, it is essential that the lower anchorages be placed in a position behind the seat so that the buckle of the buckle strap or stalk will be located at the side of the hip of a seated occupant. The buckle must not be allowed to rest on the seated person's abdomen.

The optimum distance between the lower anchorages of a seat belt is from 250 mm to 350 mm, with the minimum distance being 165 mm.

The lower seat belt anchorages must not be superimposed, ie each belt must be anchored by separate bolts.

Construction of Seat Belt Anchorages

When anchorages are located in vehicle floors, parcel shelves or other areas of the vehicle made from sheet steel, steel backing plates not less than 75 mm x 50 mm x 3 mm must be fitted.

The size of the seat belt anchorage backing plate depends upon the strength of the material which it is backing and the following must be taken into consideration when determining the size of the plate:

- the thickness of the floor pan material; and
- the shape of the floor pan, eg flat, corrugated, fluted, curved.

Backing plates should not be made thicker than 4 mm as thicker plates can shear the floor panel and reduce the strength of the anchorage. The corners of all backing plates are to have a 5 mm minimum radius and edges adjacent to the body are to be chamfered. The backing plates must be contoured to match the panel contours.

The installation instructions included in the seat belt kit must be followed. The anchor bolts must be correctly tightened. The bolt must fully engage all the thread of the nut, and this may mean that a longer bolt than that supplied with the seat belt kit is required. Fine threaded 7/16" UNF mild steel bolts are usually used.

Anchorage in aluminium or fibreglass body panels require engineering evidence to demonstrate that the anchorage is capable of withstanding the force nominated below for the particular category of seat:

Category 1 - 10 kiloNewtons

Category 2 - 6 kiloNewtons

Category 3 - 4 kiloNewtons.

The force must be applied along the direction of the line of the seat belt for not less than 30 seconds.

Anchorage and fittings must be protected from corrosion by a suitable paint or other anti-corrosive substance.

The general construction of anchorages is shown in [Figure 10](#).

Head Restraints

Rear-facing Seats

All rear-facing seats should be fitted with head restraints which provide an impact surface which meets the dimensional requirements as shown in [Figure 11](#) for the particular category of seat.

Head restraints on rear-facing seats may be provided with vertical and fore-and-aft adjustment, however, they should not be removable.

Engineering evidence is required to show that the head restraint on a rear-facing seat can withstand the load applied to the seat back and head restraint during the testing of seat-strength as required in [Appendix B](#).

Front-facing Seats

The fitting of head restraints to front-facing additional seats is optional, however, it is recommended that head restraints be fitted as they reduce whiplash injuries in rear end collisions.

Head restraints on front-facing seats may be provided with vertical and fore-and-aft adjustment and they may be removable without the use of tools.

Head restraints must provide an impact surface which meets [Figure 11](#) for the particular category of seat.

All head restraints must be constructed and contoured to decelerate horizontal movements of the occupant's head without concentrations of load on it.

All solid structural members of the head restraint must be padded with high density foam of sufficient thickness to prevent injury to the occupant's head. Refer to Padding section for the specification of a suitable high density foam.

Padding

All normal vehicle fittings that could be struck by the head of an occupant of an additional seat should be padded to reduce injury during an impact. This includes the backs of all seats immediately in front of the additional seats. As a guide, where there is clear space of more than 1.3 metres there is little chance of an adult occupant's head hitting the seat or any other fitting in front when seat belts are fastened correctly.

Where fittings not normally present in occupant compartments of vehicles are hard or have sharp edges or comers or pointed or sharp projections and are located in front of the additional seats in a position where they are likely to cause injury to occupants of the additional seats in a crash, they should be padded or otherwise treated to minimise the risk of injury. To provide sufficient protection, padding should be at least 25 mm thick.

All solid structural members of the head restraint must be padded with high density foam of sufficient thickness to prevent injury to the occupant's head.

The following padding materials, or their equivalent, show acceptable performance in passenger protection:

- semi-rigid moulded polyurethane with a density of approximately 300 kg/m³;
- self-skinning rigid moulded polyurethane with a density of approximately 300 kg/m³;
- closed-cell polyethylene foam with a density of approximately 300 kg/m³;
- closed-cell EVA foam with a density of approximately 300 kg/m³.

Foams typically used for upholstery work are not acceptable for occupant protection padding.

From 1 January 1995, ADR 3/02 is applicable to passenger cars, forward control passenger vehicles and off road passenger vehicles. This ADR is also applicable to light omnibuses and light goods vehicles from 1 July 1995. ADR 3/02 effectively requires special treatment of the rear of any seats in front of other seats to minimise injuries in a crash. After those dates, any additional seats fitted by individuals to the above vehicle types will require engineering evidence of compliance with ADR 3/02.

Appendix A

Recommendations for Seat and Occupant Space

The following head space, leg space and seat width recommendations should ensure an acceptable level of safety and comfort for the occupant of the seat.

Head Space

The head space requirements are based on the seated height of a person as shown in [Figure 1](#).

The head space requirement must apply to each additional seating position.

No part of the vehicle body or component of the roof installation may project below the shaded zone shown in [Figure 2](#).

The dimension A must be measured vertically from the highest point on the centreline of the undepressed seat cushion. Dimension A for the particular category of seat is shown in [Figure 2](#).

If the seat height is adjustable, it is to be set in the lowest position when the above measurement is taken.

Leg Space

The leg space requirements are based on the upper leg length of a seated person as shown in [Figure 1](#).

The horizontal distance from the foremost point on the centreline of the undepressed seat back to the nearest part of the vehicle body, vehicle equipment, or another seat must not be less than the dimension B shown in [Figure 3](#) for the particular category of seat.

The leg space zone must extend not less than 35 per cent of the seat width on either side of the centre line of each seating position.

Seat Width

The minimum seat width per occupant for each category of seat shall be:

- Category 1 – 410 mm;
- Category 2 – 300 mm;
- Category 3 – 250 mm

Appendix B

Rear-Facing Seat Strength

Rear-facing seats and their anchorages must comply with the requirements of the latest edition of ADR 3/...

In addition, a rear-facing seat should withstand, without imposing any load on any other seat in the vehicle, a load equivalent to twenty times the weight of the seat and its occupants applied in the forward direction relative to the vehicle. Seats intended to accommodate more than one occupant should withstand the loads applied by all occupants simultaneously. This requirement should be demonstrated with the occupant load uniformly distributed over the backrest and head restraint of the seat.

The occupant mass to be used to determine the test loads for each category of seat must be:

Category 1 - 68 kgs

Category 2 - 38 kgs

Category 3 - 26 kgs.

Appendix C

Definition of Terms

Seat Reference Point

A point which, for the purpose of these Guidelines, can be approximated by the centre of a 100 mm diameter disc placed in contact with the seat base and seat back on the centreline of the seat.

Torso Reference Line

A line passing through the Seat Reference Point and parallel to the seat back. For fully adjustable seat backs, a line passing through the Seat Reference Point and at a maximum of 30 degrees to the vertical.

FIGURE 1:

SEATED HEIGHT

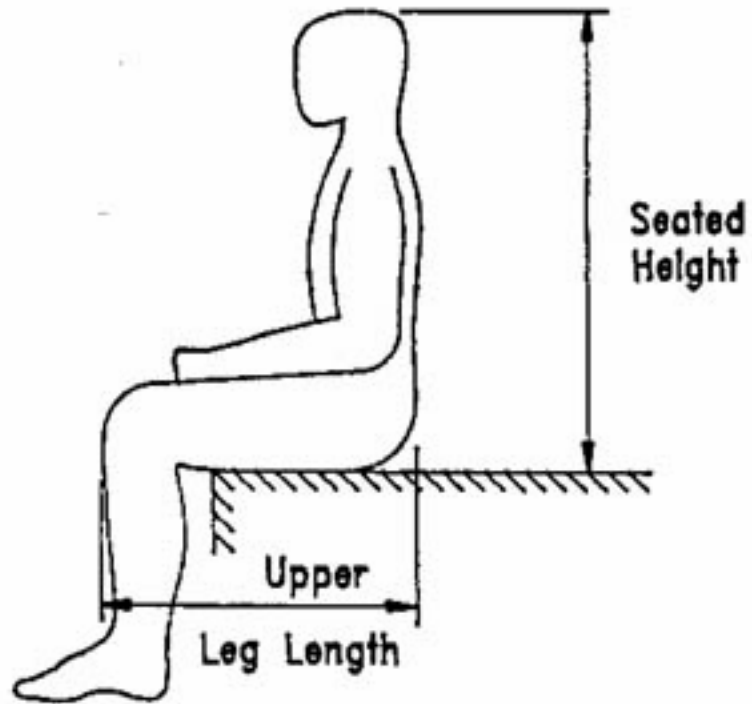
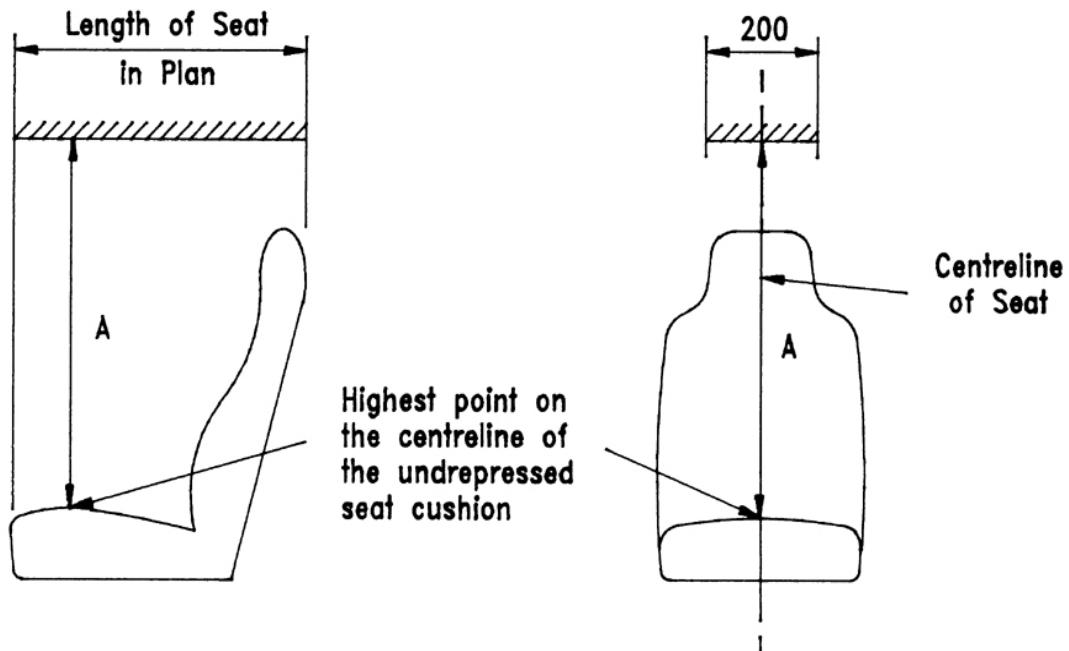


FIGURE 2

HEAD SPACE



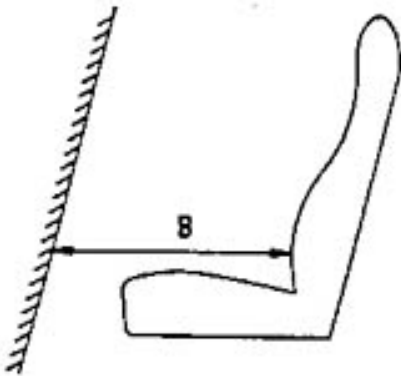
SECTION THRU Q OF SEAT

FRONT ELEVATION

CATEGORY OF SEAT	DIMENSION A
1	750 Min.
2	750 Max. 670 Min.
3	670 Max.

FIGURE 3

LEG SPACE



CATEGORY OF SEAT	DIMENSION B
1	600 Min.
2	510 Min.
3	435 Min.

FIGURE 4
SEAT FRAME CONSTRUCTION – SINGLE SEAT

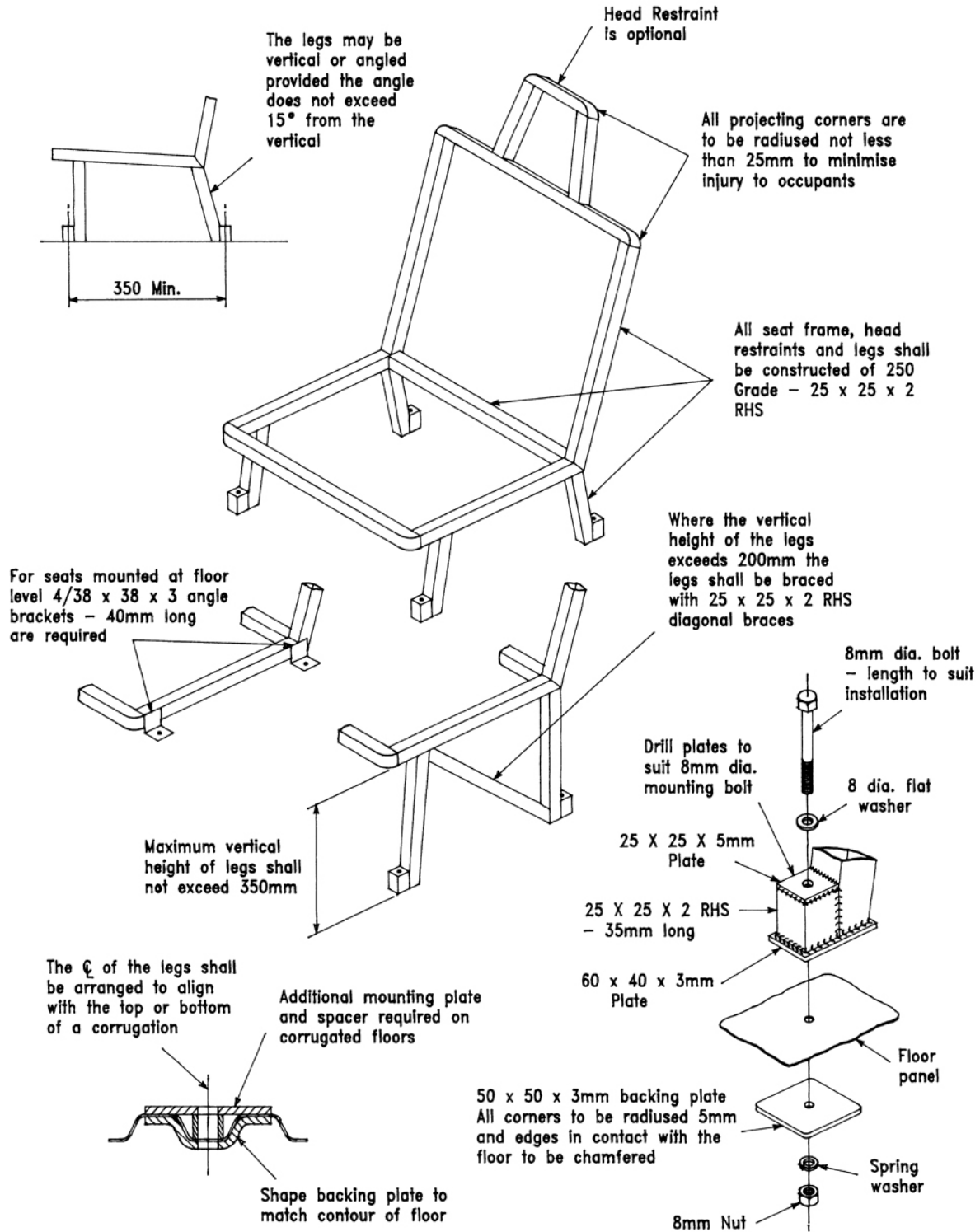


FIGURE 5
SEAT FRAME CONSTRUCTION – TWO SEATING POSITIONS

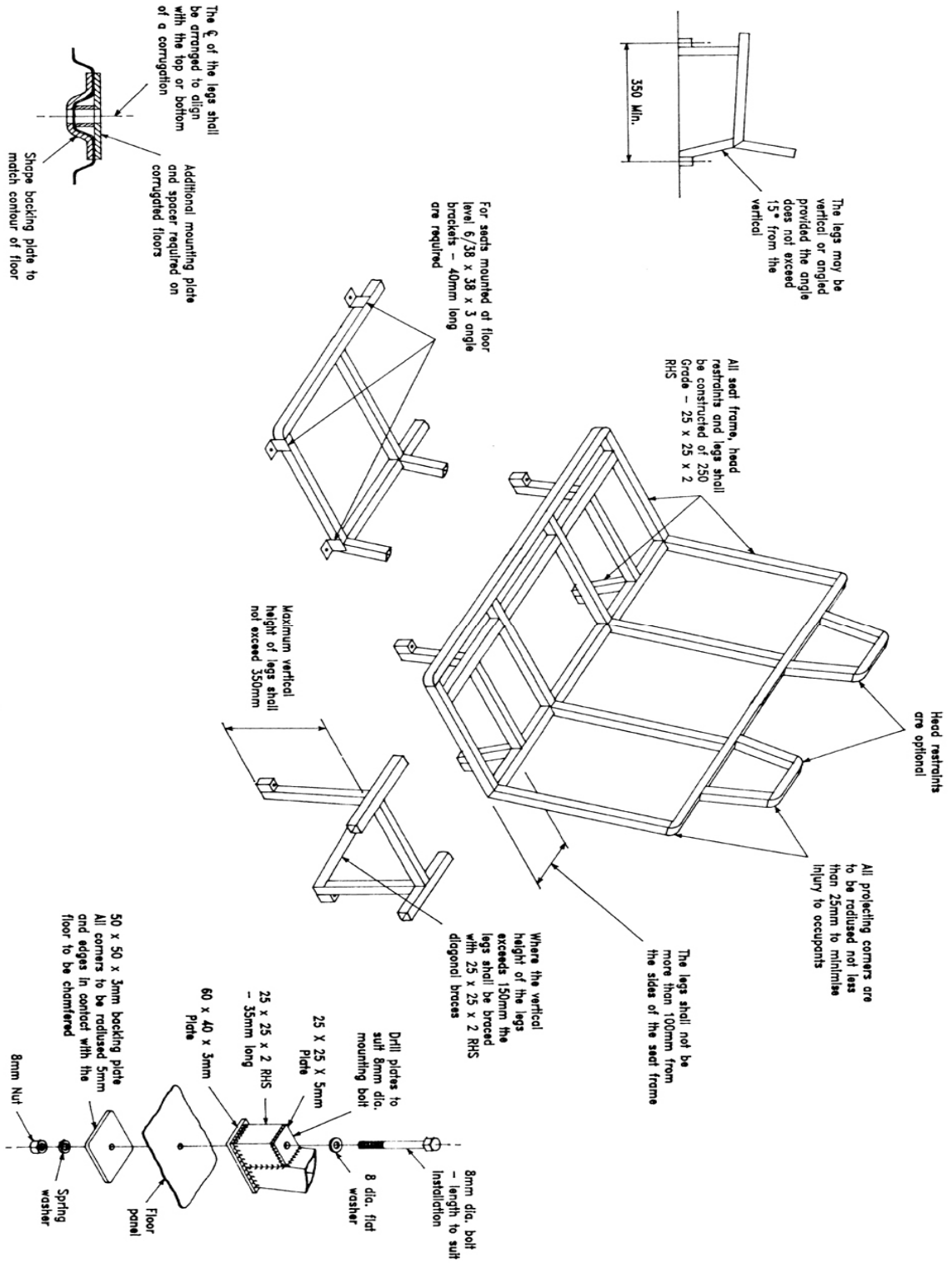


FIGURE 6

SEAT FRAME CONSTRUCTION – THREE SEATING POSITIONS

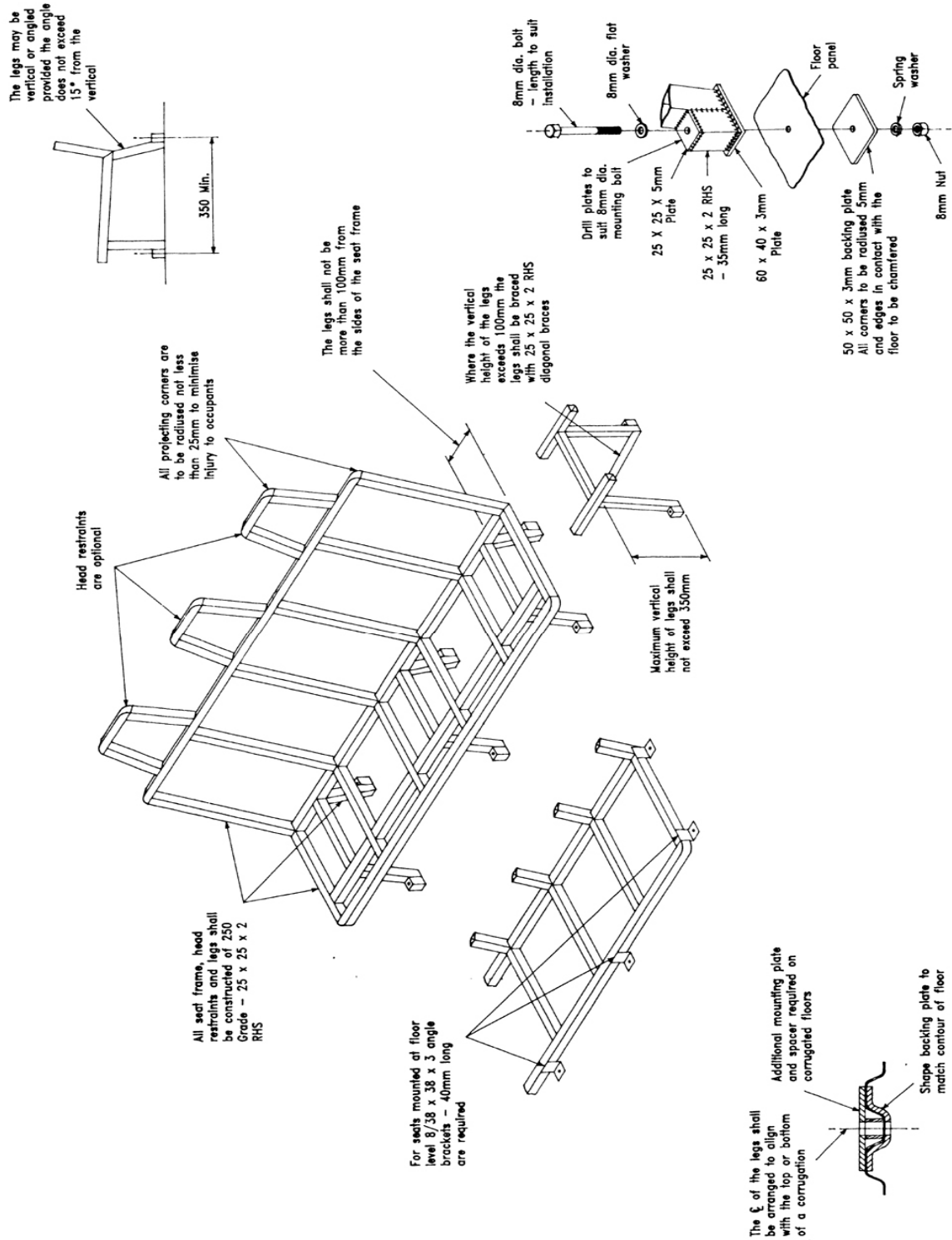
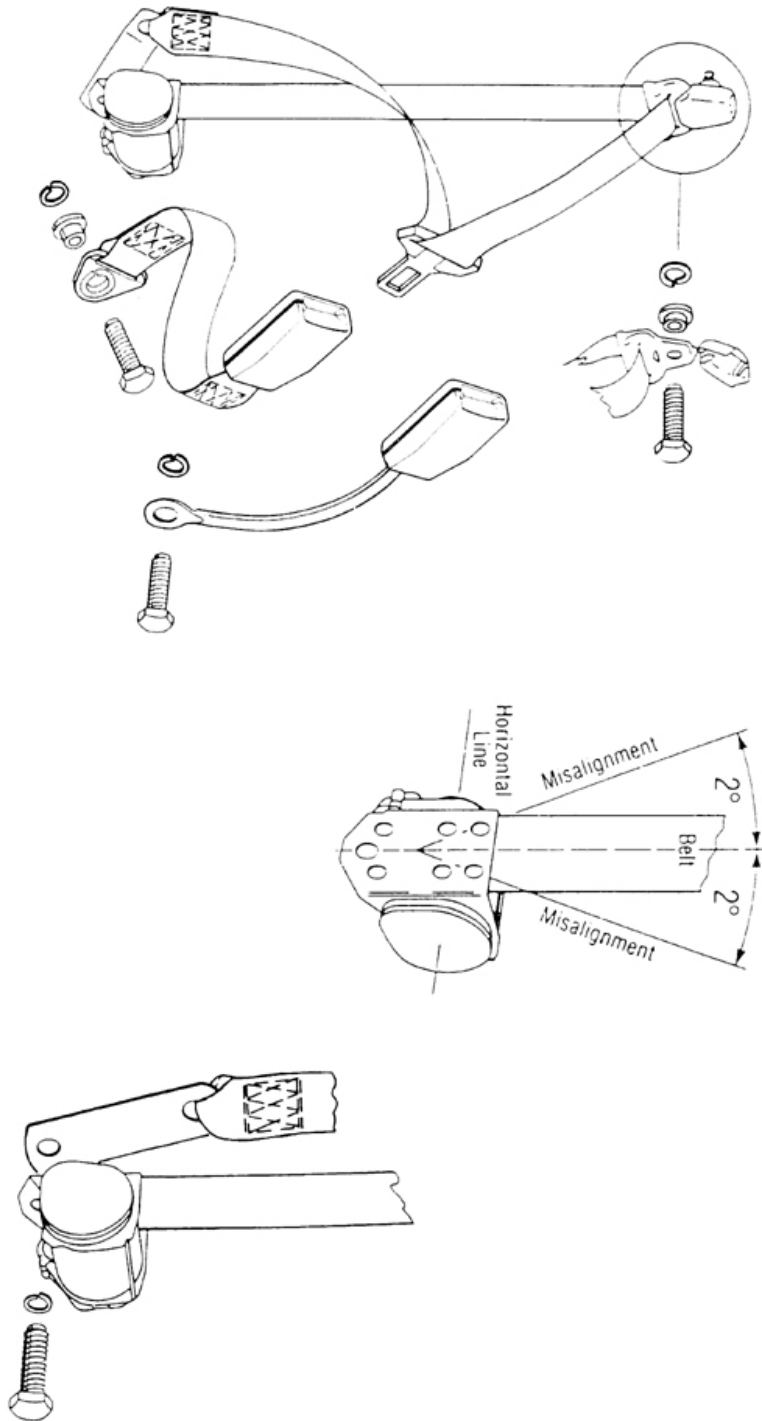


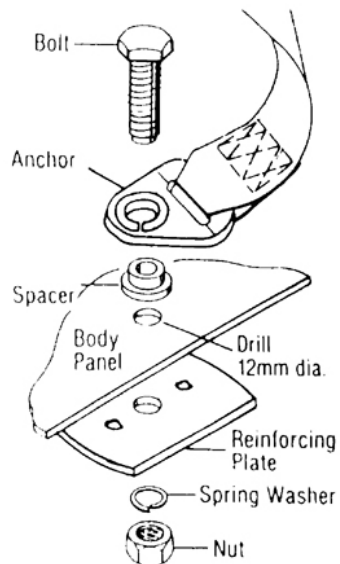
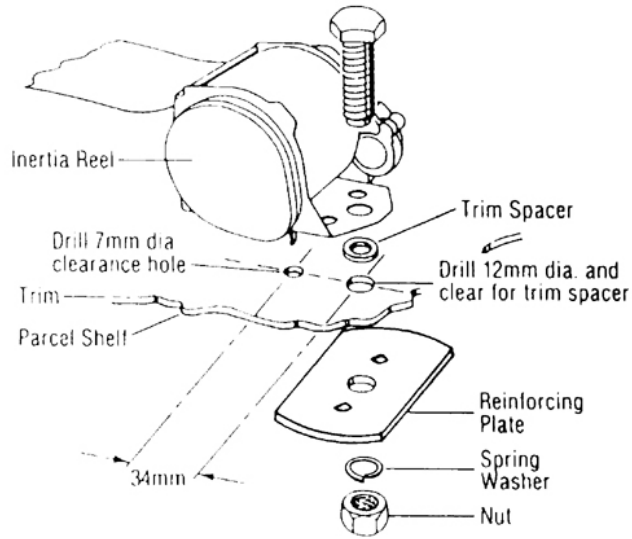
FIGURE 7

RETRACTOR BELTS – TYPICAL INSTALLATION

Front Belts



Rear Belts



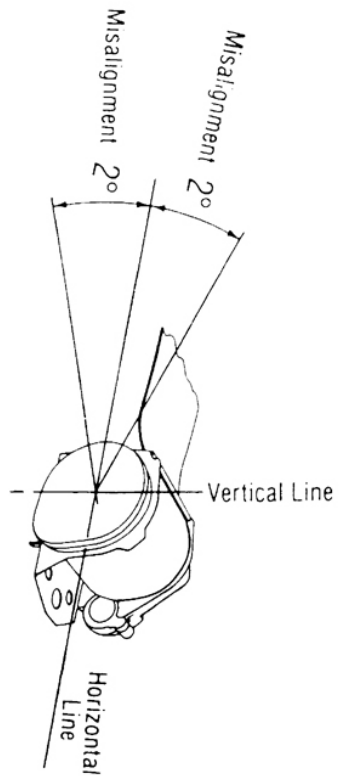
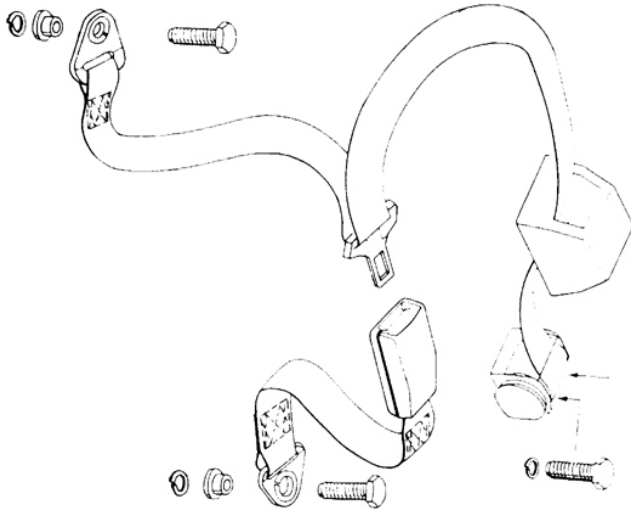
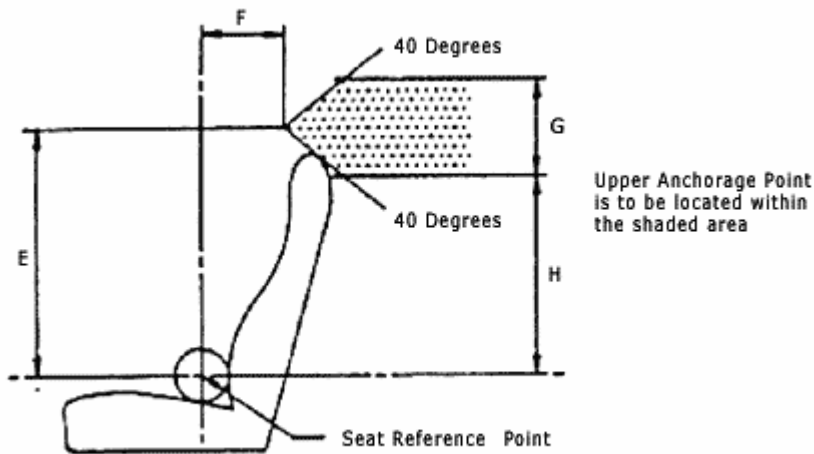


FIGURE 8:

LOCATION OF UPPER ANCHORAGES



DIMENSION	CATEGORY OF SEAT		
	1	2	3
E	550	470	410
F	120	100	90
G	300	260	230
H	400	340	300

FIGURE 9

LOCATION OF LOWER ANCHORAGES

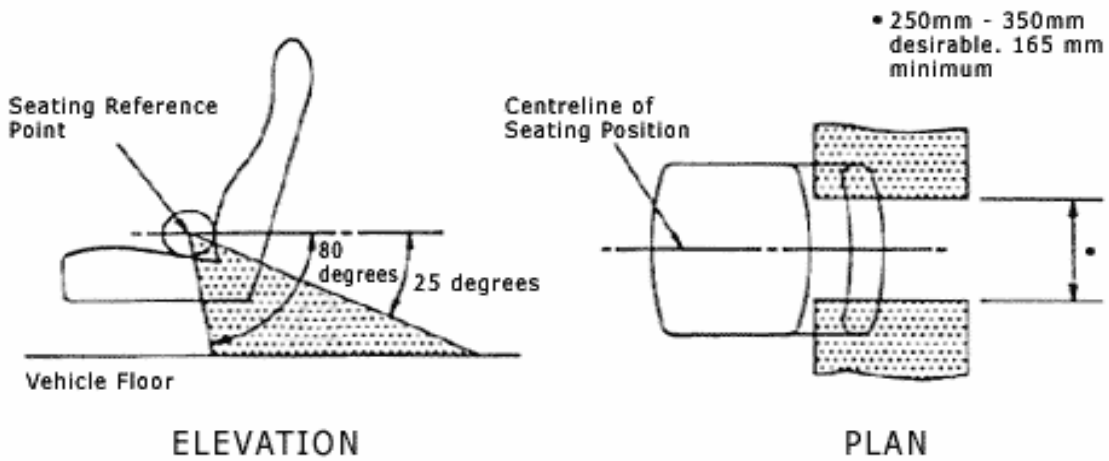


FIGURE 10

GENERAL CONSTRUCTION OF SEAT BELT ANCHORAGES

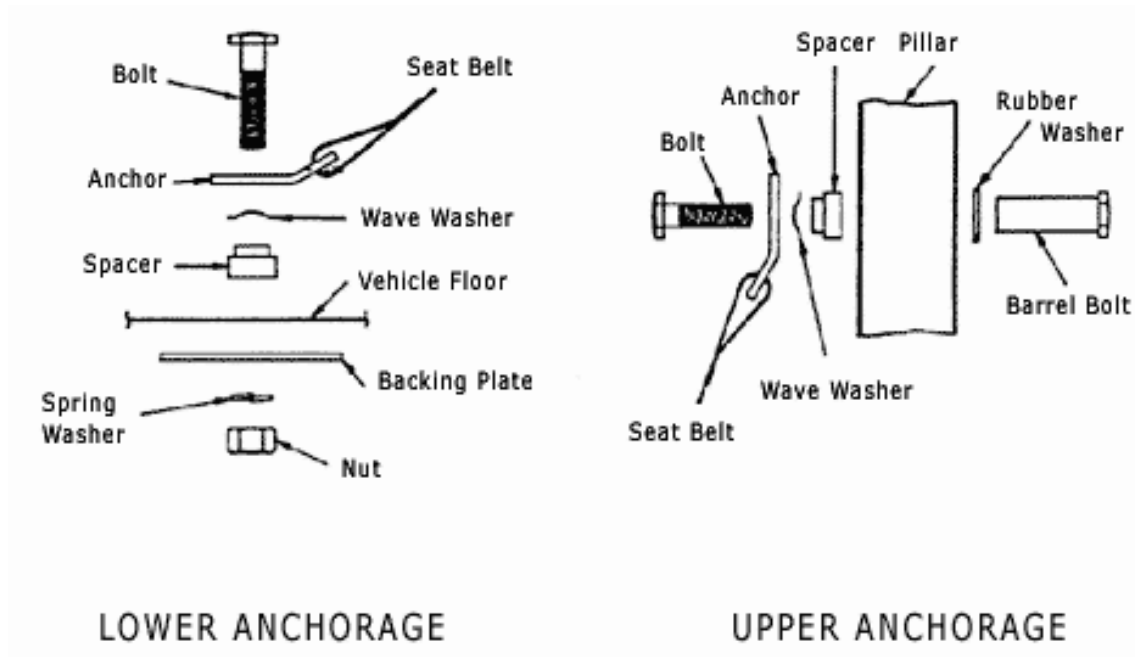
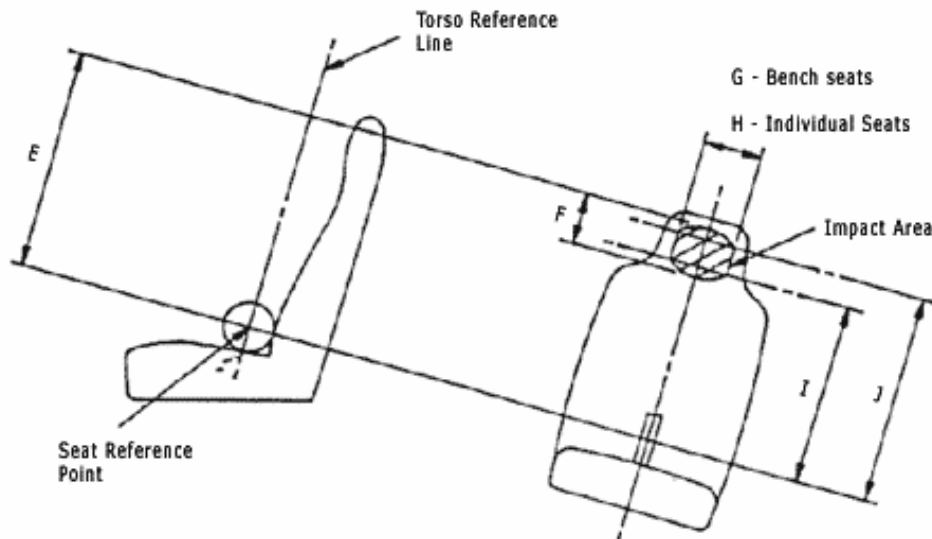


FIGURE 11

DIMENSIONS OF HEAD RESTRAINTS



DIMENSION	CATEGORY OF SEAT		
	1	2	3
E	700 Min.	600 Min.	525 Min.
F	115 Min.	115 Min.	115 Min.
G	250 Min.	250 Min.	250 Min.
H	170 Min.	170 Min.	170 Min.
I	585 Min.	485 Min.	410 Min.
J	635 Min.	535 Min.	460 Min.

SEAT REFERENCE POINT - A point which, for the purpose of these guidelines, can be approximated by the centre of a 100 mm diameter disc placed in contact with the seat base and seat back on the centreline of the seat.

TORSO REFERENCE LINE - A line passing through the Seat Reference Point and parallel to the seat back. For fully adjustable seat backs, a line passing through the Seat Reference Point and at a maximum angle of 30 degrees to the vertical.