CIRCULAR 5/02-9-1

TEST PROCEDURES

ADR 5/02 - ANCHORAGES FOR SEAT BELTS AND CHILD RESTRAINTS

“A Guide for Inspectors”

This Circular is relevant to the Third Edition of the Australian Design Rules gazetted as National Standards under the Motor Vehicle Standards Act 1989.
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1 SCOPE

This procedure, when read in conjunction with other Circulars issued by the Administrator provides sufficient information, without reference to other standards, to conduct and audit tests on Seat Belt Anchorages to demonstrate compliance with Australian Design Rule 5/01 and 5/02. ADR’s 5/01 and 5/02 have similar test requirements. ADR 5/00 has been superseded by ADR 5/01 and 5/02. ADR 5/01 differs from 5/02 in that:

- it specifies new seat belt anchorage requirements for certain Seats in categories MD2, MD3, MD4, ME, NB2 and NC vehicles;
- it specifies certain requirements for vehicles where the driver’s Seat is a Suspension Seat;
- it deletes ECE 14/01 as an acceptable Alternative Standard; and
- ADR 5/02 is extended to LE vehicles

Provided that, where appropriate, ECE 14/02 was used as the Alternative Standard, vehicles certified to the requirements of any of the Acceptable Prior Rules as shown in the Applicability Table of the ADR for a particular category shall be deemed to comply with this Rule.

Vehicles complying with ADR 34/... “Child Restraint Anchorages and Child Restraint Anchor Fittings” need not comply with the “Child Restraint Anchorage” requirements of this ADR.

Where particular requirements apply to one of the two ADR’s it is noted in the text.

For convenience reference to the relevant ADR clause number is quoted in brackets against each appropriate paragraph of this procedure.

The equipment, orders of accuracy and step by step actions described in this procedure are drawn from the standards and recommended practices quoted in the ADR and from accepted laboratory practices. While conformance with this procedure is sufficient to demonstrate compliance with the ADR, other equipment, orders of accuracy and procedures may be used provided it can be shown that they demonstrate compliance with the ADR.

This ADR calls for tests which demonstrate that

(i) the locations of all final anchorages and sash guides are within specified zones relative to the Seating Reference Planes and

(ii) the strengths of all anchorages and sash guides meet certain minimum requirements and

(iii) the deflection of the seat belt mounting system under load will not result in excessive forward movement of the restrained occupant under impact conditions.

Static test methods only are specified for seat belt anchorages.

For child restraint anchorages static or dynamic test methods may be employed.

Note that tests on seats and their anchorages to demonstrate compliance with ADR 3/01 - Seat Anchorages, may be conducted in conjunction with seat belt and child restraints anchorage tests, where if the seat belt or child restraint anchorages are mounted on the seat. Refer to Circular 3/01-9-1 for details.

This procedure is intended primarily as a guide for Officers of the Australian Department of Transport and Communications or Agents acting on behalf of the Administrator when they carry out audit inspections of Test Facilities or witness tests for compliance with the ADR. This and other Circulars dealing with Test Procedures for ADRs may also be useful to vehicle manufacturers and testing organisations.

Nothing in this Circular, however, absolves the manufacturer from complying with the requirements as specified in the ADR which always remains the primary reference.

2 SELECTION OF TEST COMPONENTS

This procedure applies to all seat belt mounting systems (unless specifically exempt) and child restraint anchorages in vehicles subject to the Design Rule. Forward facing, rearward facing and side facing seats requiring belts are also included.

See Applicability Table in Annex A showing the type of seat belt and anchorage required for vehicle categories for ADR 5/01 and 5/02.

All load testing must be conducted on a representative body shell or section thereof large enough to ensure that during testing any body distortion due to seat belt loads are contained within such section.

Some fittings for loading the anchorages may be replaced by stronger or stiffer representative items for the test.

Where the tests involve seats because the belt anchorage is attached to the seat, or the seat significantly affects the run of the belt, or the child restraint is located in the vehicle body structure more than 100mm below a horizontal plane tangential to the top point of rear seat back, then such seats must be structurally representative of production and include all hinges, seat mechanisms and fixings including those which secure the seat to the vehicle.

3 IDENTIFICATION OF TEST COMPONENTS

The body structure, seat belt fittings and any seat frame, adjusters, hinges and linkages shall be structurally representative of the design condition as reflected in the production drawings.

Further, if dynamic testing is employed for child restraint anchorage testing, the test facility must ensure that kinematically the mechanisms are also representative of the design conditions.

If production parts are being tested they should be drawn from a batch which has passed normal quality assurance procedures. They should then be identified against the production drawings. If prototype parts are being tested they should be individually inspected on a component by component basis for both dimensional and material (composition, heat treatment, finish and welding) compliance with the drawing.

In either case the revision or issue status of the drawing to
which the assemblies have been checked must be stated on all test records. Finally, a build record should be prepared showing the source and status of all material used including any body section employed. Should any used or out of specification material be employed, its use should be recorded and justified. The record should be of sufficient detail to completely identify the subject material.

4 NUMBER OF TEST ASSEMBLIES

Usually one body shell and one front seat set and one rear seat are sufficient to fully validate the model range employing one basic body. Unusual vehicle configuration or designs which provide a wide range of interior layouts may require more than one body shell.

Body and Seat structures may be used for more than one test providing the distortion (if any) produced in earlier testing is minimal and would not affect subsequent tests.

5 EQUIPMENT

5.1 Dimensional and General Tests

These tests are usually conducted in the drawing office using full scale body layout drawings or computer aided drafting techniques. The equipment required comprises a 2-D manikin, see Circular 0-12-6, and normal drafting equipment.

The vehicle manufacturer's occupant package drawings are required to determine the location of the Seating Reference Point and the Seating Reference Plane. From this data, using conventional drafting techniques the Dimensional Tests given in Section 6.1 can be conducted.

5.2 Load Testing - Static Tests

5.2.1 Basic Equipment

5.2.1.1 Test rig or rigs for rigidly securing a vehicle body (or whole section thereof) and providing mounting points for one or more static load applicators as determined by the configuration of the seat belt or child restraint anchorages.

5.2.1.2 Fixtures. These are limited to the brackets necessary to secure the body being tested to the test rig. It is usual to attach the body via the suspension mounting points and, if necessary at additional points along the underframe, while ensuring that the attachments do not reinforce the body structure in the area of the seat belt anchorages. Note that for all child restraint test anchorages are provided, two or more actuators are usually employed with a control system to ensure simultaneous load application.

5.2.1.3 Adjustable, static load application system capable of applying the following loads along a line from the appropriate sash location point for each affected seat to the corresponding upper torso reference point:-

- 5 N
- 900 N (Clause 5.6)

5.2.1.4 Adjustable, static load application see also Annex A Table 1 for loads Typically this comprises three hydraulic cylinders which can be adjusted in position to apply loads in longitudinal vertical planes as follows:-

- 2 loads of 22 kN (9.0 kN for rear facing seats) at 5 to 50 degrees above the horizontal
- 1 load of 17.7 kN (7.0 kN for rear facing seats) at 0 to 20 degrees above the horizontal.

5.2.1.5 For multiple anchorages on pillars near front seats the equipment in Section 5.2.1.4 may be set up to the loads in Clause 5.2.9 for an additional test or alternatively an additional load applicator used to provide 13.3 kN load between 0 to 20 degrees above the horizontal.

5.2.1.6 Where seat belt or child restraint anchorages are mounted on seats, (or in the case of child restraint anchorages being located in the vehicle body structure more than 100mm below a horizontal plane tangential to the top point of rear seat back) sufficient additional load applicators are required to provide simultaneously the seat belt/child restraint loads and ADR 3/01 - 'Seat Anchorage' loads - refer to Circular 3/01-9-1.

5.2.2 Control. Where the tests can be conducted using only one actuator each load can be conveniently varied manually and the load increased using a single readout device until the required load level is reached. Where, because of the seat belt anchorage configuration, more than one actuator is required, some form of automatic control for each actuator is desirable. Typically this comprises a separate hydraulic circuit for each actuator each with its own pressure limiting valve which can be pre-set to the desired load thus ensuring that the correct loads are applied simultaneously to each item under test.

5.2.3 Body Blocks etc. Clause 5.5.3 specifies that loads shall be transmitted using body blocks and Clause 5.5.4.1 specifies attachments which are representative of a seat belt. Typical body blocks are shown in Annex A and typically the belt representation is made by sewing approximately
four layers of seat belt webbing together and incorporating end fittings of thicker material than production. This latter approach reduces belt stretch, thus preventing the load cylinder running out of travel and ensures that the belt fittings do not fail as they may be subjected to many tests.

5.2.4 Instrumentation. Each required load actuator must be provided with its own independent load indicator. Again, where the tests can be conducted using only one actuator a simple single indicator may be adequate. Where, because of the seat belt or child restraint anchorage configuration more than one actuator is required, instrumentation with multi-channel recording is usually required to provide the necessary indication of loads.

5.2.4.1 Measurement. Usually two parameters, load and time, are measured. This is typically achieved by a load cell and associated electronic equipment which is suitable for multi-load actuation cases as it provides both individual load monitoring during application and multi-channel recording. Where the tests can be conducted using only one actuator a simple readout device, such as a pressure gauge, may be used and each reading recorded manually. In this case adequate calibration under quasi-static conditions to determine the effect of seal friction etc. must be made.

In some cases the deflected position of a sash guide or contact point between seat and seat belt must be determined. This is typically achieved by establishing prior to the test a datum - e.g. rigid rectangular bar - relative to an area of the body which will not be distorted by the test. The deflected position of the subject part is then measured using hand instruments relative to this datum while the load is applied.

5.2.4.2 Recording. Where automatic recording is used multi-channel light beam or pen recorders are suitable as they allow immediate reading to ensure that the required loads are achieved simultaneously in all actuators. One recording channel is required for each actuator. A system response of 10 Hz is satisfactory. The internal time line generator in the recorder or an external time base signal is usually used for time measurement. Where single channel manual recording is used, a stopwatch may be used to check test the load is held for at least 1 second.

5.2.4.3 Order of Accuracy. Except where specified in the ADR or referred documents, the following order of accuracy is considered to be commercially achievable and should be taken as a guide. instrumentation of lesser accuracy is acceptable provided it is taken into account in determining the certainty of results. The time measurements should be determined within 1%. The order of accuracy of load measurement may vary, depending on the system employed. In all cases, however, the tests must be conducted with the load reading equaling the calculated load plus maximum instrument error. A typical instrument system for load measurement would have an order of accuracy of 5%. Deflection measurements should be made within $\pm 3\mu\text{m}$.

5.2.4.4 Calibration. Routine calibration of load cells, electronic elements and recording equipment is to be carried out in accordance with Circular 0-12-3. Prior to each series of tests it is desirable that the complete load measuring system be calibrated against a known standard, e.g. deadweight, universal testing machine or transfer calibration system at a number of points.

5.3 Dynamic Testing (Child Restraint Anchorages Only)

5.3.1 Basic Equipment.

5.3.1.1 Impact sled system with the following features:
- Minimum basic sled mass of 380 kg (including vehicle body or section thereof and complete rear seat). (Clause 5.11.4.3.4)
- Capability of imparting a velocity change of at least 49 km/h to the above sled to which a mass of 21.4 kg for each Child Restraint Anchorage has been rigidly attached. The sled may be decelerated from 49 km/h to zero or may be decelerated to zero and then accelerated in the reverse direction to achieve required velocity changes.
- Capability of achieving during the velocity change a deceleration of 235 to 335 m/s² within 30 ms and maintaining that deceleration for 20 ms except for periods of less than 1 ms. (Clause 5.11.4.3.5)

5.3.1.2 Test Dummies. One dummy with a mass of not less than 21.4 kg is required for each Child Restraint Anchorage provided in the vehicle under test. Details of the dummy described by the drawings produced by the TNO (Research Institute for Road Vehicles) Netherlands for a 50th percentile 6 years old child may be found in Annex B. (Clause 5.11.4.3.1)

5.3.1.3 Fixtures. For dynamic testing the only fixtures required are those to allow the body shell (or part thereof) to be mounted to the sled to achieve a deceleration while traveling forward. These must be as rigid as feasible to reduce structural “ringing”.

5.3.2 Instrumentation. Sufficient equipment is needed to ensure that the required velocity and deceleration levels have been achieved.

5.3.2.1 Measurement. Time, initial velocity, final velocity, and the deceleration of the vehicle in the Child Restraint anchorage area are the only parameters requiring measurement. In practice this means measuring the deceleration of a rigid body structural member close to the Child
Restraint anchorage. A minimum of two decelerometers, one on each side is required together with their associated electronic systems which must have a flat frequency response within 5% from 1 to 1000 Hz. It is the responsibility of the Test Facility to demonstrate that the transducers used have measured the acceleration of the test structure. Speed is typically measured just prior to commencement of and, in the case of a system which accelerates the sled rearwards again, at the end of the deceleration pulse by measuring the time taken for the sled to pass through a “gate” using photoelectric cells or similar devices and associated electronic circuits. The velocity change is determined from the speed calculations taking directional sense into consideration.

6.1 Dimensional and General Testing (Seat Belt Anchorages)

6.1.1 Seating Capacity. Determine the effective cushion width of each seat as per Clause 5.7.3. In accordance with Clauses 5.7.1 and 5.7.2 identify the single and multiple seats and the seating capacity of each seat and the complete vehicle. See Annex A Tables for application of seat belt type to the various categories of vehicle for ADR 5/01 and ADR 5/02.

6.1.2 Seating Reference Plane

6.1.2.1 Determine driver’s Seating Reference Plane. For bench seats and as an optional procedure for individual seats this is the Vertical Longitudinal Plane though the geometric centre of the eye ellipse as described in Circular 0-12-6 and 0-12-7. For individual seats the Seating Reference Plane may be taken as the longitudinal vertical plane through the geometric centre of the seat but must not be further inboard.

6.1.2.2 Determine Seating Reference Plane for Other Positions. The Seating Reference Planes for other positions are described in ADR Definitions ‘Seating Reference Plane’ Sections (ii), (iii), (iv). 6.1.3 Seating Reference Point. This is the manufacturer’s nominated reference point for each seat as described in ADR - Definitions. Refer to Circular 0-12-6. It conventionally defines the rearmost normal driving and riding position of the 95th percentile male.

6.1.4 Seat Back Angle. Two seat back angles are to be established. The Design Seat Back Angle is that nominated by the manufacturer and defined in Clause 5.1.15 while the maximum angle for this design rule is the largest angle up to and including 30 degrees at which the seat back can be set.

6.1.5 Normal Driving and Riding Seat Track Travel. This is as nominated by the vehicle manufacturer but may be taken as the fore and aft seat movement for which seat adjustment is provided. Seating positions rearward of those provided for the 95th percentile male are not considered normal driving and riding seat track travel.

6.1.6 Pelvis Reference Point and Locus. Establish the pelvis reference, locus and pelvis reference point as follows:

6.1.6.1 Pelvis Reference Locus - the locus of a point fixed relative to the Seat, coincident with the Pelvis Reference Point when the Seat is in the rearmost design position and extended over the design or riding range of Seat travel.

6.1.6.2 Pelvis Reference Point - a point used in simulating the correct position of a lap Strap or the lap Strap of a Lap-Sash Belt. It is the point which is located at a height of 95 mm above and 70 mm forward of the Seating Reference Point. These points take into consideration seat travel and any increase in seat height which is automatically provided by the seat adjusters.

6.1.7 Seat Position Classification. Determine whether each seating position is inboard or outboard in accordance with ADR Definitions which define an outboard seating position as:- ‘a forward or rearward facing seating position nearest a vehicle side wall where any part of the top of the seat cushion is within 200 mm of the side wall.’

6.1.8. Provision of Anchorages. Confirm that for each seating position (except where specifically excluded):-
6.1.9 Seat Belt Configurations Required. By reference to the Tables in Annex A describing the seat belt required for each seating position of all vehicles for ADR 5/01 and ADR 5/02 establish that the appropriate seat belt is provided for each outboard seating position and that anchorages for the necessary retraction mechanisms are provided.

6.1.10 Sash Guide Classifications. Determine for each seating position with upper torso restraint whether the sash guide is a component of a seat belt or not according to Clause 5.3.1.1 and whether it is load bearing or not according to Clause 5.3.1.2.

Establish for each seating position with upper torso restraint the type of sash guide provided with, or for, the seat belt.

The types are:

A. Sash guides which are the anchor fittings at final torso anchorages and are the only sash guides in the system. These are load bearing sash guides, components of seat belt assemblies and sash location points.

B. Sash guides which are the only sash guides additional to the anchor fittings at the final torso anchorages. These are load bearing sash guides, components of seat belt assemblies and sash location points.

C. Sash guides other than types A and B described above.

6.1.11 Design of Anchorages. Establish:

- that seat belts can be readily replaced (Clause 5.2.2);
- that any adjustment the sash location point or guides can be affected without tools (Clause 5.4.2.2.3);
- which anchorages are designed to accept more than one anchor fitting. These are to be considered as two (or more) anchorages (Clause 5.2.8) for testing purposes.

6.1.12 Location of Anchorages and Sash Guides

6.1.12.1 Lap Anchorages. Establish that the lap anchorages associated with each seating position comply with Clauses 5.4.1.1, 5.4.1.2, 5.4.1.3.1, and for vehicle categories MD3, MD4, ME, NB2 and NC with Clause 5.10.2. Establish whether the length of the strap between lap anchor point and pelvis reference point measured along the centre line in side view of the strap installed exceeds the direct distance by more than 60 mm (Clause 5.4.1.3.2). If not, the design complies with this Clause. If it does exceed 60 mm then the deflection of the seat must be measured under load to determine compliance. In this case reference should be made to Section 6.2.4.

6.1.12.2 Sash Location Point. Establish on the drawing the nominal line of the belt strap from the Sash Location Point to the Upper Torso Reference Point. Establish the transverse distance ‘S’ for the Sash Location Point according to Clause 5.1.18 and areas A and B as defined in Clause 5.9.1 and Clause 5.9.2 respectively.

Then confirm:

- that, if non adjustable, the Sash Location Point has a minimum of 140 mm ‘S’ dimension and lies in Area A (Clauses 5.4.2.1.1 and 5.4.2.1.2);
- that, if adjustable, at least one point complies with the requirements of Clause 5.4.2.1.1 and that the minimum height requirements of Clause 5.4.2.2.2 are met;
- that, if the sash guide is non-load bearing, the next load bearing sash guide lies in Area A or Area B (Clause 5.3.7.1) and that the 60 mm rule in Clause 5.3.7.2 is met for both the design seat back angle and the maximum seat back angle (Clause 5.3.9).

6.1.12.3 Harness Anchorage. Determine for a single point harness anchorage that it lies at least 500 mm behind the Torso Reference Line, within 50 mm of the Seating Reference Plane and within Area B in side view (Clause 5.4.3.1). Determine for two point harness anchorages whether they lie at least 75 mm behind the Torso Reference Line, within Area B and meet the transverse location requirements of Clause 5.4.3.2.

6.1.13 Adjustable Anchorages and Sash Location Points. Where adjustment is provided, the structural implications of applying the loads described in Section 6.2 at every point over the adjustment range must be analysed and a suitable test program devised.

6.1.14 Anchorages on Pillars. Where a lap anchorage is located on a pillar close to the front row of seats, the requirements of Clause 5.2.9 should be checked to determine whether the additional load test requirements of that Clause are met. If so the program in Section 6.2.4 must include these tests.

6.1.15 Sash Guide General. Using the classifications in Section 6.1.10:-

6.1.15.1 Sash Guide Types A and B. Confirm that the strap cannot be removed from the guide without the use of tools or that the automatic return requirements of Clause 5.3.5 are met and that the sash guide has been validated for both the dynamic testing procedure of ADR 4/00 ‘Seat Belts’ and the static strength of assembly test in the Australian Standard 2597 - 1983 Method of Testing Seat Belts as quoted in ADR 4/—.

6.1.15.2 Sash Guides - Type C. Confirm that the strap cannot be removed from the guide without the use of tools or that the automatic return requirements of Clause 5.3.5 are met (load bearing sash guides only) and that the sash guide has been validated against the following Clauses of ADR 4/00 :-
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6.1.16 Dimensional Test - Child Restraint Anchorages. Using the manufacturers occupant package check that the SAE 2D manikin, see Circular 0-12-6, is positioned relative to the rear seat(s) and determine the location of the Seating Reference Point(s) and the Torso Reference Line(s) in side view. (Refer ADR Definitions for Seating Reference Plane and Seating Reference Point).

6.1.16.1 Determine that each adult Seating Reference Plane nominated by the manufacturer in plan view is:
   (a) for seats designed for only one occupant, the vertical plane through the geometric centre of the seat.
   (b) for seats designed for two occupants, in the case of outboard seating positions, at least 200 mm from the vehicle centreline and at least 200 mm from the vehicle inner panel (or the line of the panel) measured transversely through the Seating Reference Point.

6.1.16.2 (Clause 5.1.7). Determine the Design Line of Action in side view by drawing a line from the Upper Anchor Fitting (Figure 4 of ADR 5/00) located using the Australian Standard 1754 ‘Recommended Fixings and Spacers’ (Figure 5 of ADR 5/00) to the Shoulder Point (300 mm above the Seating Reference Point) measured along the Torso Reference Lines, deflected if necessary by the seat back. (Refer Annex B - Test Equipment Diagrams).

6.1.16.3 (Clause 5.11.4.2.1). Determine the direction of Test Load (static testing). This is to be within 20 degrees of the Design Line of Action and not more than 5 degrees to the left or right of the longitudinal axis of the vehicle except where the Design Line of Action is determined by the seat back and the upper anchorage is more than 100 mm below the top of the seat back. In this case the direction of test load shall be within 5 degrees of the longitudinal axis of the vehicle through a point at the top of the seat back via a flexible strap connected to upper anchorage.

6.1.16.4 (Clause 5.11.1.1). For passenger cars (MA) determine that one Child Restraint Anchorage is provided for each adult Seating Reference Plane except where a rear seat back is divided for individual folding into two or more sections and a division lies substantially on the Seating Reference Plane of a middle seating position when a child restraint anchorage need not be provided for that seating position.

For MB, MC and MD1 Category vehicles determine that one anchorage is provided for each rear seat with a minimum of three anchorages if more than three seating positions are provided with adult seat belt assemblies (Clause 5.11.1.2) except where a rear seat back is divided into two or more sections which may be folded independently of each other and the division between sections lies substantially along the seating reference plane of the middle seating position a child restraint anchorage need not be provided for that seating position (Clause 5.11.1.2.3)

6.1.16.5 (Clause 5.11.1.3). Ensure that the anchorage incorporates an internal thread of 5/16 inch - 18 UNC - 2B.

6.1.16.6 (Clause 5.11.1.4.2). Ensure that no items need to be removed to gain access to the anchorage except closure plugs and items movable without the use of tools.

6.1.16.7 (Clause 5.11.1.5). Ensure that the vehicle handbook or other data supplied with the vehicle includes:
   (a) The warning specified in Clause 5.11.1.5.1.
   (b) Details of fixings, including spacers which are required to install the Child Restraint Anchor Fitting.
   (c) The correct length of bolt.

Check that the bolt and fixings in (b) and (c) achieve at least 5 (five) full threads of engagement.

6.1.16.8 (Clause 5.11.2.1). Check that each Child Restraint Anchorage lies within 40 mm of the corresponding Seating Reference Plane.

6.1.16.9 (Clause 5.11.2.2). Check that anchorages are wholly within the vehicle.

6.1.16.10 (Clause 5.11.2.3). Check that each anchorage is located rearwards of a line 140 mm rearward of and parallel to each corresponding Torso Reference Line - see Annex B(d).

6.1.16.11 (Clause 5.11.3.1). Check that with the fixings and bolt length specified by the manufacturer, the Upper Anchor Fitting can be installed using a 5/16 inch - 18 UNC hexagon headed bolt using hand tools and that no obstruction prevents 5 full threads of engagement.

6.1.16.12 (Clause 5.11.3.2). Check that sufficient clearance exists around the anchorage to latch and unlatch the Child Restraint Attachment Clip (Figure 3 of ADR 5/01 or 5/02) to the Upper Anchor Fitting with that fitting installed to the manufacturer’s specification.

6.1.16.13 (Clause 5.11.3.3). If the manufacturer specifies spacers, check that they conform to the dimensions in Figure 5 of ADR 5/01 or 5/02.

6.1.17 Post Test Dimensional Checks. The tests in Section 6.1.1 to 6.1.16 inclusive can be conducted in the drawing office. The following dimensional checks must be made where appropriate using the locations determined under the appropriate loads to establish that critical deflections are not excessive.
- Seat deflection - see Section 6.1.12.1.
- Sash Location Point - the location requirements in Section 6.1.12.2 must be met under 5 N and 900 N loads as per Clause 5.4.2.1.
- Sash guide deflection. For load bearing sash guides not part of a seat belt assembly, the requirements of Clauses 5.3.8 are to be met under an 8.5 kN load as per Clause 5.6.2 for both the design back angle and the maximum back angle as per Clause 5.3.9.

6.2 Load Testing - Seat Belt Anchorages

6.2.1 Sash Guide Strength (Clause 5.3.3) - Type B and C Sash Guides Only.

6.2.1.1 Preparation. With the vehicle body mounted on the test rig and the upper torso restraint system (including the seat if the seat belt run touches the seat together with a representation of any automatic belt adjuster) installed, set the load applicator at the correct angle to apply a tensile belt load from the Sash Location Point to the Upper Torso Reference point. Set up datum lines to allow the deflected Sash Location Point to be measured.

6.2.1.2 Test. Apply a 5 N load and measure the deflected Sash Location Point which is the point on the belt centreline where the strap first changes direction after leaving the Upper Torso Reference Point. Repeat with a 900 N load. Repeat for each sash guide requiring testing.

6.2.1.3 Determination of Results. Transfer the measured data to the vehicle layout drawing - refer to Section 6.1.12.2 - and confirm that:
- there is no substantial distortion;
- the sash guide remains integral with the structure;
- the deflected Sash Location Point remains within Area A after allowing for any change in Area A due to change in ‘S’ distance.

6.2.1.4 Reporting Results. The results of each test are to be recorded in a complete internal report giving a full description of material tested, equipment used, results and order of accuracy. For submission to the Administrator the determined results for loads, deflected position and distortion, are to be recorded together with the internal report number in the appropriate section of the Summary of Evidence Report. See Section 8.

6.2.2.1 Preparation. Repeat the setting up as per Section 6.2.1.1 except that a load applicator capable of 8.5 kN is required and a reinforced seat belt strap is desirable. The sash guide and its mounting must be representative of production.

6.2.2. Test. Repeat Section 6.2.1.2 except that an 8.5 kN load is to be used. Repeat for each sash guide/guide position requiring testing. Note that a range of positions may need testing for adjustable guides.

6.2.2.3 Determination of Results. Transfer the measured data to the vehicle layout drawing - refer to Section 6.1.12.2 - and confirm that the length of that belt strap from final anchor point to Upper Torso Reference Point via the sash location point has not been reduced by more than 60 mm as a result of sash guide deflection.

In the case of non adjustable sash guides confirm that the deflected Sash Location Point lies within Area A or Area B allowing for any change in Area A due to change in ‘S’ distance. Where an adjustable seat back affects these results, the test must be conducted with the seat back at both the design angle and the maximum angle (Clause 5.3.9).

In the case of adjustable sash guides, confirm that at no point in the adjustment range (refer Section 6.1.13.) does the deflected sash location point fall below plane DJ or CE in Figures 1 and 2 of the ADR.

6.2.2.4 Reporting Results. See Section 6.2.1.4.

6.2.3 Sash Guide Strength - Seat Back Mounted Guides (Clause 5.3.4).

6.2.3.1 Preparation. Where a seat back forms a sash guide in conjunction with a positive restraining device mounted on the seat back, set the 50 N force applicator up to produce a lateral, horizontal force away from the Seating Reference Plane. This may be performed with the seat in any position or mounted on a rig plate out of the body shell.

6.2.3.2 Test. Apply a 50 N load for a minimum of 1 sec to the restraining device.

6.2.3.3 Determining Results. Determine that the restraining device will withstand the 50 N load.

6.2.3.4 Reporting Results. See Section 6.2.1.4.

6.2.4 Seat Belt Anchorage Strength - All Systems. Vehicle Categories MA, MB, MC, MD1, MD2, NA and NB1 (Clause 5.21.1) (Alternative requirements for vehicle categories MD3, MD4, ME, NB2 and NC - Clause 5.2.0.1.2) - (see Section 6.2.6).

6.2.4.1 Preparation for Test. Review the program of tests for the model range and confirm that the worst case criteria in Section 2.2 have been met and that the loads specified in Clause 5.2.6.4 and shown in Annex A Table 1 are to be applied to the appropriate anchorages as specified in Clause 5.5.4.1 and shown in Annex A Table 2. For each test, set the load applicators so that the direction of loading for each body block meets the direction of loading requirements of Clause 5.5.5. Where one or more seat belt anchorages are
located on a seat ensure that the seat and its anchorages are mounted to the body using production fixings set to minimum specified torque and set in the rearmost position. Also ensure that an additional load applicator is set up to produce a forward load of 20 times the complete seat weight as specified in ADR 3/01. Refer to Circular 3/01-9-1. If the doors comply with ADR 2/00 they may be closed otherwise they are open or removed (Clause 5.5.1).

In cases where the line of belt pull causes the belt to contact any part of a seat ensure that a representative seat or section thereof is mounted in the body in the production manner and set in the rearmost position (Clause 5.5.2).

In cases where the length of the lap strap between anchor point and pelvis reference point measured along the installed belt centre line in side view exceeds 60 mm more than the direct distance between these points (due to seat interference), set up a datum to allow seat deflection under belt loads to be established. Refer to Section 6.1.12.1. Ensure that any load bearing sash guide and its mountings are representative of production unless the guide design has been validated as part of a seat belt assembly test. In the latter case a strengthened guide of the correct geometry may be employed for the anchorage test. Clause 5.5.4.2.2. Ensure that the loading belt passes through all load bearing sash guides. Belts may by-pass non load bearing guides for this series of tests - Clause 5.5.4.2.1.

Review the instrumentation, set scales and zeros and check load settings and calibration by artificially restraining the load actuators and applying the full test load plus allowance for instrument error simultaneously to all anchorages. Apply a small settling load to the body blocks and ensure that sufficient travel is available from the load actuators.

6.2.4.2 Test. Operate the test rig and ensure that the required net loads are applied for a minimum of one second. Where required record the deflected position of the seat at the point(s) of contact of the belt strap with the seat. Transfer this data to the package layout, refer to Section 6.1.12.1, and ensure that the path of the belt strap around the deflected seat is, in side view, such that the 60 mm requirement of Clause 5.4.1.3.2 is met. 6.2.4.3 Determination of Results. Where results are achieved by direct readout devices the figures are to be recorded directly. Where recorders are used the results are to be determined as soon as possible after the test. Confirm instrument calibration. Any charts etc. are to be retained as original data.

6.2.4.4 Reporting Results. - See Section 6.2.1.4.

6.2.5 Strength Test on Pillars with Multiple Anchorages (Clause 5.2.9). When a pillar connecting roof structure to underframe structure is designed to accept upper torso loads and a lap anchorage load, an extra test comprising simultaneous application of loads to the lap body block and an upper torso body block is necessary. This test may be incorporated in the tests in Section 6.2.4 or may be an additional test as described below.

6.2.5.1 Preparation. For this test strengthened anchor plates and sash guides may be used provided the production geometry is reproduced. For this test the seat need not be fitted. Set the body blocks and load applicator to apply a total of 26.6 kN comprising at least 13.3 kN to the upper torso body block and the remainder to the lap body block.

Ensure that the loads are applied in longitudinal vertical planes with the lap anchorage loads between 5 degrees and 50 degrees above the horizontal and the upper torso load between 0 and 20 degrees above the horizontal.

6.2.5.2 Test. Operate the test rig and ensure that the required net loads are applied for a minimum of one second. Determine results as per Section 6.2.5.3. See Section 7 for analysis of results.

6.2.5.3 Determination of Results. See Section 6.2.4.3.

6.2.5.4 Reporting Results. See Section 6.2.1.4.

6.2.6 Anchorage Strength (Requirements for Vehicle Categories MD3, MD4, ME, NB2 and NC - Clause 5.2.0.1.2).

6.2.6.1 Load Testing Method (Clause 5.10.3.3).

6.2.6.1.1 Preparation. Review the program of tests for the model range and confirm that the worst case criteria in Section 2.2 have been met.

6.2.6.1.1 For Lap Anchorages, the pair shall be tested simultaneously and the attachments shall pass round an appropriate body block to which the load specified in Clause 5.10.3.3 of 9 kN is applied at an angle of between 5 degrees and 50 degrees.

6.2.6.1.2 Final Torso Anchorage shall be tested simultaneously with the anchorage common to both pelvic and upper torso restraint and the attachment shall pass round an appropriate body block to which the load specified in Clause 5.10.3.3 of 9 kN is applied at an angle of between 0 degrees and 20 degrees.

Where one (or more) seat belt anchorage is located on a seat ensure that the seat and its anchorages are mounted to the body using production fixings set to minimum specified torque and set in the rearmost riding position and adjusted for height (where applicable) to achieve the manufacturer’s Seating Reference Point location.

6.2.6.1.3 For ADR 5/02 in the case of an NB2 or an NC vehicle, where the Anchorages are mounted on the Seat the test for the seat belt Anchorage shall also include a simultaneous load of 10 times the weight of the entire Seat (ADR
that a reinforcement of 3750 mm² area and 3 mm seat belt anchorages to be assessed by ensuring that each is restrained using a suitable restraint comprising load bearing material having an elongation of not more than 25% when subjected to a load of 11 kN (Clause 5.11.4.3.2). Each pelvic restraint position is to be attached to the corresponding adult lap anchorage and each upper torso restraint position is to be attached to the Child Restraint Anchorage.

6.2.7.4 Sled Calibration. (Clause 5.11.4.3.5) Remove the test dummies and attach a mass of 21.4 kg times the number of rear seating positions rigidly to the sled. Ensure that the mass of the resulting moving sled is at least 380 kg plus the mass representing the removed dummies. Operate the test rig and make adjustments if necessary to achieve the following velocity-time profile after allowing for instrument uncertainty:-
- Minimum velocity change 49 km/h.
- The deceleration is maintained within these limits for 20 ms, except for periods of less than 1ms.

6.2.7.4.3 Test. Clause 5.11.4.3.6. Remove the calibration masses and re-install the dummies, ensuring that the restraint system is adjusted to eliminate slack. Operate the test rig and determine the results as in Section 6.2.7.5.

6.2.7.5 Determination of Results. The deceleration-time profile and gate transit time(s) are read from the recorder charts and any deceleration peak of less than 3 ms duration disregarded provided that it can be shown to be due to ‘ringing’ of the instrumentation. This should be done as soon as possible after the tests, together with a check that instrument calibrations have not changed. Any charts etc are to be
retained as original data. Velocity change is determined by calculation given the length of the speed gate(s).

6.2.7.6 Reporting Results. For each test an internal report giving a complete description of the material tested, equipment used, results and order of accuracy is to be prepared. For submission to the Administrator the determined results for deceleration and time are to be recorded together with the internal report number in the appropriate section of the Summary of Evidence Report - see Section 8.

7 ANALYSIS OF RESULTS

7.1 Seat Belt Anchorages - Vehicle Categories MA, MB, MC, MD1, MD2, NA and NB1 (or alternatively for categories MD3, MD4, ME, NB2 and NC).
The design is deemed to meet the requirements of ADR 5/01 or 5/02 if:-
- the dimensional and general requirements of Section 6.1.8, 6.1.9, 6.1.11, 6.1.12, 6.1.13 and 6.1.15 are met and
- the Post Test Dimensional Requirements of Section 6.1.17 - see also Sections 6.2.1, 6.2.2 and 6.2.4 - are met.
- the loads in Sections 6.2.1, 6.2.2, 6.2.3, 6.2.4 and 6.2.5 are satisfactorily withstood while meeting the other requirements of these Sections.

7.2 Seat Belt Anchorages - Vehicle categories MD3, MD4, ME, NB2 and NC.
The design is deemed to meet the requirements of ADR 5/01 and ADR 5/02 if:-
- the dimensional requirements in Sections 6.1.12.1 are met and
- the design requirements of Sections 6.2.6.2 are met or, under the load test conditions of Section 6.2.6.1 the anchorages withstand a net body block load of 9 kN without serious distortion for a minimum of 1 second.
For ADR 5/02, NB2 or NC vehicles with anchorages mounted on the seat the additional seat load of 10 times its weight must be attained.

7.3 Child Restraint Anchorages
The anchorage systems are deemed to have conformed to ADR 5/01 and ADR 5/02 if the load, deceleration dimensional and functional requirements of Section 6.2.7 have been met without separation of the anchorage from its adjacent body work and without general structural failure of the body shell.

8 SUMMARY OF EVIDENCE REPORT
The Summary of Evidence Report SE 5/01 is the only document to be sent to the Administrator for demonstration of compliance to ADR 5/01 or 5/02. The original test report identification number, the location of the test report, the test facility identification number and the determined results are to be recorded in the appropriate place in the SE 5/01 form for each relevant clause of the ADR.

9 PROCEDURE FOR DESIGNS WITH CERTIFICATION TO ALTERNATIVE STANDARDS

9.1 ADR 5/01 The technical requirements of ECE R 14/01 or 14/02 ‘Safety Belt Anchorages’ shall be deemed to be equivalent to the technical requirements for location (Clause 5.2.5) and strength (Clause 5.2.6) of seat belt ‘Anchorages’ for front facing seating positions.

9.2 ADR 5/02 The technical requirements of ECE R 14/02 - Safety Belt Anchorages shall be deemed to be equivalent to the technical requirements for location (Clause 5.2.5 and 5.3.6) and strength (Clause 5.2.6) of seat belt Anchorages for front-facing seating positions.

9.3 There is no acceptable alternative standard covering the ‘Child Restraint Anchorage’ requirements of this ADR.
In these cases the relevant part of SE 5/01 shall be completed.

10 REFERENCES

ADR References
ADR Definitions
ADR 2/00 - Door Latches and Hinges
ADR 3/01 - Seat Anchorages
ADR 4/00 - Seat Belts
ADR 5/00 - Anchorages for Seat Belts and Child Restraints
Society of Automotive Engineers Recommended Practices:-
J826b (Jan 1978) - Devices for Use in Defining and Measuring Vehicle Seating Accommodation
J826 (April 1980) - Devices for Use in Defining and Measuring Vehicle Seating Accommodation
J941(b) (Feb 1969) - Motor Vehicle Driver’s Eye Range
J941(c) (June 1972) - Motor Vehicle Driver’s Eye Range
J941(d) (Feb 1975) - Motor Vehicle Driver’s Eye Range
J941(e) (Mar 1977) - Motor Vehicle Driver’s Eye Range
J384 (May 1976) - Motor Vehicle Seat Belt Anchorages - Test Procedures
Australian Standards
AS E35-1970-Seat Belt Assemblies for Motor Vehicles
AS 2597-1983-Methods of Testing Seat Belts
Circulars
Circular 0-12-2 - General Requirements for Test Facilities
Circular 0-12-3 - General Requirements for Calibration of Test Equipment and Instrumentation
Circular 0-12-6 - Devices for use in Defining and Measuring Motor Vehicle Seating Accommodation
Circular 0-12-7 - Motor Vehicle Driver’s Eye Range
Other References
TNO (Research Institute for Road Vehicles) Netherlands. Data for 50th percentile 6 year old child
ECE Regulation No. 44 - Uniform Provisions Concerning the Approval of Restraining Devices for Child Occupants of Power Driver Vehicles (Child Restraints)
ECE Regulation 14/01/02 - Uniform Provisions Concerning the Approval of Vehicles with Regards to Safety Belt Anchorages on Passenger Cars
ANNEX A

These Tables Apply to ADR 5/02 and ADR 5/01
## ANNEX A

### TABLE SHOWING TYPE OF SEAT BELT AND ‘Anchorages‘ REQUIRED (3)

#### ADR 5/01

<table>
<thead>
<tr>
<th>Vehicle Category</th>
<th>MA</th>
<th>MB</th>
<th>MC</th>
<th>MD1</th>
<th>MD2</th>
<th>MD3</th>
<th>MD4</th>
<th>ME</th>
<th>NA</th>
<th>NB1</th>
<th>NB2</th>
<th>NC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Front Row Seats</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Driver</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>L/R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>L/R</td>
<td></td>
</tr>
<tr>
<td>Outboard Passenger</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>-</td>
<td>-</td>
<td>R</td>
<td>R</td>
<td>L/R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centre</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>L</td>
<td>L</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

| ‘Second Row Seats’ |     |     |    |     |     |     |     |    |    |     |     |    |
| Outboard (1)       | R  | R  | L/S | R  | -   | -   | -   | -  | -  | -   | -   |     |
| Centre             | L  | L  | L   | L  | -   | -   | -   | -  | L  | L   | -   |     |

3rd etc Row ‘Seats’

| Outboard (2)       | L/S | R  | L/S | R  | -   | -   | -   | -  | -  | -   | -   |     |
| Centre             | L  | L  | L   | L  | -   | -   | -   | -  | L  | L   | -   |     |

<table>
<thead>
<tr>
<th>Vehicle Category</th>
<th>MA</th>
<th>MB</th>
<th>MC</th>
<th>MD1</th>
<th>MD2</th>
<th>MD3</th>
<th>MD4</th>
<th>ME</th>
<th>NA</th>
<th>NB1</th>
<th>NB2</th>
<th>NC</th>
</tr>
</thead>
</table>

Where:

- L = ‘Lap Anchorage’
- L1 = At least ‘Lap Anchorage’
- L/S = Lap/Sash = Lap + Upper Torso
- R = Lap/Sash with Retractor
- - = no requirement

#### ADR 5/02

<table>
<thead>
<tr>
<th>Vehicle Category</th>
<th>MA</th>
<th>MB</th>
<th>MC</th>
<th>MD1</th>
<th>MD2</th>
<th>MD3</th>
<th>MD4</th>
<th>ME</th>
<th>NA</th>
<th>NB1</th>
<th>NB2</th>
<th>NC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Front Row Seats</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>L/R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>L/R</td>
<td></td>
</tr>
<tr>
<td>Outboard Passenger</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>-4</td>
<td>R</td>
<td>R</td>
<td>L/R</td>
<td></td>
</tr>
<tr>
<td>Centre</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>-4</td>
<td>-4</td>
<td>-4</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td></td>
</tr>
</tbody>
</table>

| ‘2nd Row Seats‘ |     |     |    |     |     |     |     |    |    |     |     |    |
| Outboard (1)     | R  | R  | L/S | R  | R(PS) | -4  | -4  | -4 | L/S | L/S | L  | L  |
| Centre           | L  | L  | L   | L  | L(PS)| -4  | -4  | -4 | L  | L   | L   | L  |

3rd etc Row ‘Seats’

| Outboard (2)      | L/S | R  | L/S | R(PS) | -4  | -4  | -4  | L/S | L/S | L  | L  | L  |
| Centre            | L  | L  | L   | L   | L(PS)| -4  | -4  | -4 | L  | L   | L   | L  |

<table>
<thead>
<tr>
<th>Vehicle Category</th>
<th>MA</th>
<th>MB</th>
<th>MC</th>
<th>MD1</th>
<th>MD2</th>
<th>MD3</th>
<th>MD4</th>
<th>ME</th>
<th>NA</th>
<th>NB1</th>
<th>NB2</th>
<th>NC</th>
</tr>
</thead>
</table>

Where:

- L = At least ‘Lap Anchorage’
- L/S = Lap/Sash = Pelvic Restraint + Upper Torso Restraint
- R = Lap/Sash with Retractor
- - (4) = EXCEPT FOR ‘ROUTE SERVICE OMNIBUSES’, ‘ANCHORAGES’ AS SET OUT IN SECTION 5.10 ARE TO BE PROVIDED FOR ALL NON-‘PROTECTED SEATS’, .
- R (PS), L (PS) = “R” or “L” ANCHORAGE RESPECTIVELY REQUIRED FOR NON-‘PROTECTED SEATS’ ONLY.

**NOTES:**

1. If no ‘Permanent Structure’, then ‘Lap Anchorages’ are acceptable.
2. If ‘Seat’ is adjustable for conversion of occupant space to luggage or goods space and is not an outboard ‘Seat’ in the front or second row of ‘Seats’ then ‘Lap Anchorages’ are acceptable.
3. Upper torso restraint ‘Anchorages’ shall not be provided for side-facing ‘Seats’ (see Clause 5.2.4.4).
TABLE 1

<table>
<thead>
<tr>
<th>‘ANCHORAGE’ UNDER TEST</th>
<th>MINIMUM TOTAL LOAD TO BE APPLIED TO BODY BLOCK OR BLOCKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Lap Anchorages’ provided for ‘Lap Belt’ system only.</td>
<td>22.0 kN for front-facing and side-facing seating positions</td>
</tr>
<tr>
<td>‘Anchorage’ common to both pelvic and upper torso restraint in a ‘Lap-Sash Belt’ or ‘Harness Belt’ system.</td>
<td>22.0 kN for front-facing seating positions.</td>
</tr>
<tr>
<td>‘Lap Anchorages’ provided for pelvic restraint only in a ‘Lap-Sash Belt’ system.</td>
<td>9.0 kN for rear-facing seating positions.</td>
</tr>
<tr>
<td>‘Final Torso Anchorages’ and ‘Harness Torso Anchorages’.</td>
<td>9.0 kN for rear-facing seating positions.</td>
</tr>
</tbody>
</table>

TABLE 2

<table>
<thead>
<tr>
<th>‘ANCHORAGE’ UNDER TEST</th>
<th>OTHER APPROPRIATE ‘ANCHORAGE’</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Lap Anchorage’ provided for ‘Lap Belt’ system.</td>
<td>The other ‘Lap Anchorage’ for that seating position.</td>
</tr>
<tr>
<td>‘Anchorage’ common to both pelvic and upper torso restraint in a Lap-Sash Belt’ system.</td>
<td>‘Final Torso Anchorage’ and/or the ‘Lap Anchorage’ for that seating position.</td>
</tr>
<tr>
<td>‘Lap Anchorage’ provided for pelvic restraint only in a ‘Lap-Sash Belt’ system.</td>
<td>‘Anchorage’ common to both pelvic and upper torso restraint in a ‘Lap-Sash Belt’ system.</td>
</tr>
<tr>
<td>‘Final Torso Anchorage’.</td>
<td>‘Anchorage’ common to both pelvic and upper torso restraint in a ‘Lap-Sash Belt’ system.</td>
</tr>
<tr>
<td>‘Anchorage’ common to both pelvic and upper torso restraint in a ‘Harness Belt’ system.</td>
<td>The other ‘Anchorage’ common to both pelvic and upper torso restraint and/or the ‘Harness Torso Anchorage’.</td>
</tr>
<tr>
<td>‘Harness Torso Anchorage.’</td>
<td>One or both ‘Anchorages’ common to both pelvic and upper torso restraint in a ‘Harness Belt’ system.</td>
</tr>
</tbody>
</table>
ANNEX A

(a) Typical Body Blocks

Number and Description of dimensions of dimensions dummy

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Description</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Back</td>
<td>Back of buttocks to front knee</td>
<td>20.5 in</td>
</tr>
<tr>
<td>2</td>
<td>Back</td>
<td>of buttocks to popliteus, sitting</td>
<td>312</td>
</tr>
<tr>
<td>3</td>
<td>Centre</td>
<td>Centre of gravity of seat</td>
<td>190</td>
</tr>
<tr>
<td>4</td>
<td>Chest</td>
<td>Chest circumference</td>
<td>580</td>
</tr>
<tr>
<td>5</td>
<td>Chest</td>
<td>Chest depth</td>
<td>135</td>
</tr>
<tr>
<td>6</td>
<td>Chest</td>
<td>Distantia biacromialis</td>
<td>250</td>
</tr>
<tr>
<td>7</td>
<td>Head</td>
<td>Head breadth</td>
<td>141</td>
</tr>
<tr>
<td>8</td>
<td>Head</td>
<td>Head length</td>
<td>175</td>
</tr>
<tr>
<td>9</td>
<td>Hip</td>
<td>Hip circumference, sitting</td>
<td>668</td>
</tr>
</tbody>
</table>
Hip circumference, standing (not shown) 628

Hip depth, sitting 168

Hip width, sitting 229

Neck width 79

Seat to elbow 155

Shoulder width 295

Sitting eye height 536

Sitting height 636

Sitting shoulder height 403

Sole to popliteus, sitting 283

Stature (now shown) 1166

Thigh high, sitting 95

Component | Mass in kg for 6 years age group
---|---
Head + neck | 3.45 0.10
Torso | 8.45 0.20
Upper arm (2x) | 1.85 0.10
Lower arm (2x) | 1.115 0.05
Upper leg (2x) | 4.10 0.15
Lower leg (2x) | 3.00 0.10
Total | 22 0.50

MANIKIN MASSES
ANNEX B

TEST EQUIPMENT DIAGRAMS
CHILD RESTRAINT ANCHORAGES

(a) DIRECTION OF TEST LOAD - ANCHORAGES ABOVE SEAT BACK

(b) DIRECTION OF TEST LOAD - ANCHORAGES LEVEL WITH SEAT BACK
ANNEX B

TEST EQUIPMENT DIAGRAMS
CHILD RESTRAINT ANCHORAGES

(c) DIRECTION OF TEST LOAD - ANCHORAGES 100 MM BELOW SEAT BACK
ANNEX B

(d) SECOND ROW SEAT or VEHICLE REAR SEAT

ALL 'CHILD RESTRAINT ANCHORAGES' SHALL BE LOCATED TO THE REAR OF THIS PLANE

'TORSO REF. LINE'

140

(Dimensions in mm) SCALE 1:10
ANNEX C

THE PREFERRED METHOD OF IDENTIFYING SEAT BELT ANCHORAGE POSITIONS IS TO SHOW THEIR LOCATION BY X, Y AND Z CO-ORDINATE ON A THREE DIMENSIONAL REFERENCE GRID. THE REFERENCE PLANES ARE:

- VERTICAL LONGITUDINAL PLANE
- VERTICAL TRANSVERSE PLANE
- HORIZONTAL PLANE

2. EXAMPLE OF 3 DIM. REFERENCE GRID.

- ● UPPER SIDE ANCHORAGE
- △ INBOARD LAP ANCHORAGE
- ○ OUTBOARD LAP ANCHORAGE

<table>
<thead>
<tr>
<th>X</th>
<th>1000</th>
<th>1100</th>
<th>1200</th>
<th>1300</th>
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<th>1500/1600</th>
<th>1700</th>
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GRID SCALE: - 10mm = 100mm

(a) Typical Co-ordinate Location References
(b) Typical Seat Belt Loading Systems