CHILD RESTRAINT EVALUATION PROGRAM

SERIES 7

DEFINITIONS, TEST AND TEST RIG SPECIFICATIONS AND PROCEDURES

Version 1.10

25 March 2021

Contents

Child Restraint Evaluation Program

Stage 7

Rules, Definitions and Test Specifications and Procedures

2020

1. INTRODUCTION

A review has been completed of the Child Restraint Evaluation Program (CREP) stage 7 dynamic test protocols, with the outcome being a recommendation, accepted by the stakeholders, to expand the Program to examine more thoroughly the side impact and frontal impact performance of child restraint systems (CRS) generally. This has resulted in the need to review and respecify the scoring protocols, the test specifications and the test procedures. This document sets out revisions to the test specifications and the procedures. The revised scoring protocols are described in the document CHILD RESTRAINT EVALUATION PROGRAM, STAGE 7, SCORING PROTOCOLS AND RULES, 2021

2. TEST PROGRAM

Each Child Restraint System (CRS) type (i.e. make and model) shall be assessed via two frontal and one side impact tests.

Frontal impact tests:

1. Shall be conducted at a nominal sled velocity change of 56 km/h, with a maximum sled deceleration between 33 g and 34 g.
2. In the first frontal test, a test dummy representing the lower age range for the CRS type shall be used. In the second frontal test, a test dummy representing the upper age range for the CRS type shall be used.

Side impact tests:

1. Shall be conducted using a side impact test with intruding door as specified in UNECE R129 but with some modification, such as using a higher velocity and greater intrusion. The test is conducted using an intruding door angled at 90^0 to the direction of impact and this applies to all CRS Types
2. In the side impact test, a test dummy representing the upper age range for the CRS type shall be used

3. TEST CONFIGURATION OF CRS

All CRS are to be tested with all removable comfort pads and sun shades/hoods removed, except for A1 type CRS when tested using Q0 where all the removable comport pads are left fitted in their original places.

4. TOLERANCES

All measurements are to be within $\pm$ 5mm unless otherwise stated and compliant with SAE J211.

5. DEFINITIONS

Axes

- Positive x-axis will be directed forward relative to the vehicle.
- Positive y-axis will be directed laterally from left to right.
- Positive z-axis will be directed vertically downward
- Axis definition as per SAE J670 and J211

CRS Seating Reference Plane

- The vertical plane, front to rear, through the centre of the child restraint seating position.
- The vertical plane is the plane containing the x and z axes.

Frontal Impact Test Seat

- A seat structure manufactured in accordance with Figure 2 of this document.

Head Excursion

- The forward or upward movement of the head of the dummy measured from the ***Test Seat Datum Point***, in frontal testing of Types A, B, E, F and G CRS, as specified.
- Head excursion is measured in the projection of the vertical plane

Internal ATD Upper Neck Loads

- Fx polarity is positive when the ATD head is pushed rearward and/or the chest is pushed forward. +Fx represents a posteriorly directed shear force on the ATD neck.
- Fz polarity is positive when the ATD is pulled upwards or the chest is pushed downward. +Fz represents a tensile load on the ATD's neck.
- Mx polarity is positive when the left eaar of the ATD is pushed towards the left shoulder of the ATD. +Mx represents left lateral flexion load on the ATD neck.
- My polarity is positive when the chin of the ATD is pushed towards the sternum. +My represents a forward flexion moment on the ATD neck.
- As per SAE J211.

ISOFIX Low Anchorages

- A pair of 6 mm diameter rigid round horizontal bars extending from the vehicle which are designed to accept ***Lower Attachment Connectors*** fitted to a child restraint.

ISOFIX Interface Surface

- The rearmost surfaces of the ***ISOFIX Low Anchorages***.

Locking Device

- Either a seatbelt lock-off or a locking clip that minimises slack being introduced into the seatbelt.

Lower Attachment Connectors

- A pair of connectors, either rigid or flexibly attached, extending from the child restraint, that are designed to engage with ***ISOFIX Low Anchorages*** in a vehicle.

Side Impact Test Seat

- A seat structure manufactured in accordance with Figure 3 of this document.

Test Seat Datum Point in Frontal Impact Test

- A point that is in the plane of a vertical line through the intersection of the seat cushion and seat back of the frontal impact test seat.
- The projection of the seat bight into the vertical plane.

Test Seat Seating Reference Plane

- In frontal testing it is the vertical plane, front to rear, through the mid-point of the test seat.

6. DYNAMIC TESTING – GENERAL REQUIREMENTS

- All dynamic tests shall be conducted using a rebound test sled and in a room with temperature in the range 18ºC to 25ºC.
- Tests to be conducted within 45 minutes of CRS and dummy installation.
- The duration between tests shall be a minimum of 30 minutes, to allow for test seat cushion recovery.

7. DYNAMIC TESTING - TEST SPECIFICATIONS FOR TYPE A CHILD RESTRAINT SYSTEMS

Test Matrix 1

Frontal and 90º side impact testing - Type A1 CRS and Convertibles in Type A1 Mode

Impact	Sled pulse	Test Dummy	Camera Frame Rates & Locations	Data required
Frontal	Velocity change of 56 ± 0.5 km/h Peak deceleration between 33*g* and 34*g, with 29g being* achieved in not more than 30ms and maintained above 29*g* for not less than 18ms.	Q0	• Stationary overhead to provide an overall view of the test. • Stationary oblique to provide an overall view of the test. • Stationary at 90° to provide an overall view of the test • Stationary behind the sled with the lens centre aligned with a horizontal plane 800mm above CR point. • On-board on parcel shelf • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Head retention • Torso retention • Maximum dummy's head upward displacement
90º Side	The test rig shall reproduce a relative velocity between the door panel and the test bench in compliance with the velocity profile shown in Figure 1 with the time zero is at 100 ± 10mm from the edge of the test bench. The velocity of the leading face of the door panel will be zero at 300 mm of intrusion, i.e. the bench centre line.	Q0	• Stationary at 90° to sled travel with the centre of the lens aligned with the centre of the test bench. • Stationary overhead with the centre of the lens aligned with the centre of the test bench. • Stationary oblique to provide an overall front view of the test. • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Head retention • Torso retention

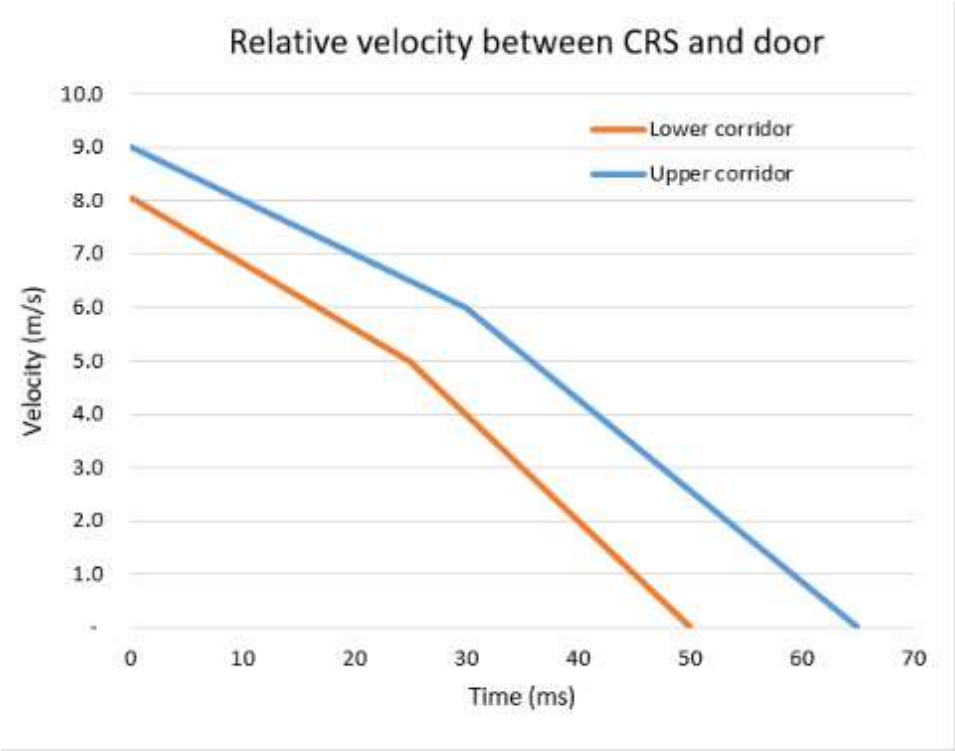


Figure 1. Side impact velocity profile

Test Matrix 2

Frontal and 90º side impact testing - Type A2 CRS and Convertibles in Type A2 Mode

Impact	Sled pulse	Test Dummy	Camera Frame Rates & Locations	Data required
Frontal	Velocity change of 56 ± 0.5 km/h Peak deceleration between 33*g* and 34*g, with 29g being* achieved in not more than 30ms and maintained above 29*g* for not less than 18ms.	Q0 and Q1	• Stationary overhead to provide an overall view of the test. • Stationary oblique to provide an overall view of the test. • Stationary at 90° to provide an overall view of the test • Stationary behind the sled with the lens centre aligned with a horizontal plane 800mm above CR point. • On-board on parcel shelf. • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Chest deflection (Q1 only) • Upper neck forces plus peak + Fz (Q1 only) • Upper neck moments plus peak -My (Q1 only) • Head retention • Torso retention • Maximum dummy's head upward displacement
90º Side	The test rig shall reproduce a relative velocity between the door panel and the test bench in compliance with the velocity profile shown in Figure 1 with the time zero is at 100 ± 10mm from the edge of the test bench. The velocity of the leading face of the door panel will be zero at 300 mm of intrusion, i.e. the bench centre line.	Q1	• Stationary at 90° to sled travel with the centre of the lens aligned with the centre of the test bench. • Stationary overhead with the centre of the lens aligned with the centre of the test bench. • Stationary oblique to provide an overall front view of the test. • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Upper neck forces plus peak +Fz (tension force) • Upper neck moments plus peak Mx (absolute value) • Head retention • Torso retention

Test Matrix 3

Frontal and 90º side impact testing - Type A4 CRS and Convertibles in Type A4 Mode

Impact	Sled pulse	Test Dummy	Camera Frame Rates & Locations	Data required
Frontal	Velocity change of 56 ± 0.5 km/h Peak deceleration between 33*g* and 34*g, with 29g being* achieved in not more than 30ms and maintained above 29*g* for not less than 18ms.	Q0 and Q3	• Stationary overhead to provide an overall view of the test. • Stationary oblique to provide an overall view of the test. • Stationary at 90° to provide an overall view of the test • Stationary behind the sled with the lens centre aligned with a horizontal plane 800mm above CR point. • On-board on parcel shelf • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Chest deflection (Q3 only) • Upper neck forces plus peak + Fz (Q3 only) • Upper neck moments plus peak -My (Q3 only) • Head retention • Torso retention • Maximum dummy's head upward displacement
90º Side	The test rig shall reproduce a relative velocity between the door panel and the test bench in compliance with the velocity profile shown in Figure 1 with the time zero is at 100 ± 10mm from the edge of the test bench. The velocity of the leading face of the door panel will be zero at 300 mm of intrusion, i.e. the bench centre line.	Q3	• Stationary at 90° to sled travel with the centre of the lens aligned with the centre of the test bench. • Stationary overhead with the centre of the lens aligned with the centre of the test bench. • Stationary oblique to provide an overall front view of the test. • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Upper neck forces plus peak +Fz (tension force) • Upper neck moments plus peak Mx (absolute value) • Head retention • Torso retention

8. DYNAMIC TESTING - TEST SPECIFICATIONS FOR TYPES B CHILD RESTRAINT SYSTEMS

Test Matrix 4

Frontal and 90º side impact testing - Type B CRS and Convertibles in Type B Mode

Impact	Sled pulse	Test Dummy	Camera Frame Rates & Locations	Data required
Frontal	Velocity change of 56 ± 0.5 km/h Peak deceleration between 33*g* and 34*g, with 29g being* achieved in not more than 30ms and maintained above 29*g* for not less than 18ms.	Q1 and Q3	• Stationary overhead to provide an overall view of the test. • Stationary oblique to provide an overall view of the test. • Stationary at 90° to provide an overall view of the test • Stationary behind the sled with the lens centre aligned with a horizontal plane 800mm above CR point. • On-board on parcel shelf. • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Chest deflection • Upper neck forces plus peak + Fz • Upper neck moments plus peak -My • Head retention • Torso retention • Maximum dummy's head forward displacement
90º Side	The test rig shall reproduce a relative velocity between the door panel and the test bench in compliance with the velocity profile shown in Figure 1 with the time zero is at 100 ± 10mm from the edge of the test bench. The velocity of the leading face of the door panel will be zero at 300 mm of intrusion, i.e. the bench centre line.	Q3 with 25mm height spacer	• Stationary at 90° to sled travel with the centre of the lens aligned with the centre of the test bench. • Stationary overhead with the centre of the lens aligned with the centre of the test bench. • Stationary oblique to provide an overall front view of the test. • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Upper neck forces plus peak +Fz (tension force) • Upper neck moments plus peak Mx (absolute value) • Head retention • Torso retention

9. DYNAMIC TESTING - TEST SPECIFICATIONS FOR TYPES E AND F CHILD RESTRAINT SYSTEMS

Test Matrix 5

Frontal and 90º side impact testing - Type E CRS and Convertibles in Type E Mode

Impact	Sled pulse	Test Dummy	Camera Frame Rates & Locations	Data required
Frontal	Velocity change of 56 ± 0.5 km/h Peak deceleration between 33*g* and 34*g, with 29g being* achieved in not more than 30ms and maintained above 29*g* for not less than 18ms.	Q3 and Q6	• Stationary overhead to provide an overall view of the test. • Stationary oblique to provide an overall view of the test. • Stationary at 90° to provide an overall view of the test • Stationary behind the sled with the lens centre aligned with a horizontal plane 800mm above CR point. • On-board on parcel shelf. • 1000 frames per second. •	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Chest deflection • Upper neck forces plus peak + Fz • Upper neck moments plus peak -My • Head retention • Torso retention • Maximum dummy's head forward displacement
90º Side	The test rig shall reproduce a relative velocity between the door panel and the test bench in compliance with the velocity profile shown in Figure 1 with the time zero is at 100 ± 10mm from the edge of the test bench. The velocity of the leading face of the door panel will be zero at 300 mm of intrusion, i.e. the bench centre line	Q6 with 45mm height spacer	• Stationary at 90° to sled travel with the centre of the lens aligned with the centre of the test bench. • Stationary overhead with the centre of the lens aligned with the centre of the test bench. • Stationary oblique to provide an overall front view of the test. • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Upper neck forces plus peak +Fz (tension force) • Upper neck moments plus peak Mx (absolute value) • Head retention • Torso retention

Test Matrix 6

Frontal and 90º side impact testing - Type F CRS and Convertibles in Type F Mode

Impact	Sled pulse	Test Dummy	Camera Frame Rates & Locations	Data required
Frontal	Velocity change of 56 ± 0.5 km/h Peak deceleration between 33*g* and 34*g, with 29g being* achieved in not more than 30ms and maintained above 29*g* for not less than 18ms.	Q3 and Q10	• Stationary overhead to provide an overall view of the test. • Stationary oblique to provide an overall view of the test. • Stationary at 90° to provide an overall view of the test • Stationary behind the sled with the lens centre aligned with a horizontal plane 800mm above CR point. • On-board on parcel shelf. • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Chest deflection • Upper neck forces plus peak + Fz • Upper neck moments plus peak -My • Head retention • Torso retention • Maximum dummy's head forward displacement
90º Side	The test rig shall reproduce a relative velocity between the door panel and the test bench in compliance with the velocity profile shown in Figure 1 with the time zero is at 100 ± 10mm from the edge of the test bench. The velocity of the leading face of the door panel will be zero at 300 mm of intrusion, i.e. the bench centre line	Q10	• Stationary at 90° to sled travel with the centre of the lens aligned with the centre of the test bench. • Stationary overhead with the centre of the lens aligned with the centre of the test bench. • Stationary oblique to provide an overall front view of the test. • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Upper neck forces plus peak +Fz (tension force) • Upper neck moments plus peak Mx (absolute value) • Head retention • Torso retention

10. DYNAMIC TESTING - TEST SPECIFICATIONS FOR TYPES G CHILD RESTRAINT SYSTEMS

Test Matrix 7

Frontal and 90º side impact testing - Type G CRS and Convertibles in Type G Mode

Impact	Sled pulse	Test Dummy	Camera Frame Rates & Locations	Data required
Frontal	Velocity change of 56 ± 0.5 km/h Peak deceleration between 33*g* and 34*g, with 29g being* achieved in not more than 30ms and maintained above 29*g* for not less than 18ms.	Q1 and Q6	• Stationary overhead to provide an overall view of the test. • Stationary oblique to provide an overall view of the test. • Stationary at 90° to provide an overall view of the test • Stationary behind the sled with the lens centre aligned with a horizontal plane 800mm above CR point. • On-board on parcel shelf. • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Chest deflection • Upper neck forces plus peak + Fz • Upper neck moments plus peak -My • Head retention • Torso retention • Maximum dummy's head forward displacement
90º Side	The test rig shall reproduce a relative velocity between the door panel and the test bench in compliance with the velocity profile shown in Figure 1 with the time zero is at 100 ± 10mm from the edge of the test bench. The velocity of the leading face of the door panel will be zero at 300 mm of intrusion, i.e. the bench centre line	Q6 with 45 mm height spacer	• Stationary at 90° to sled travel with the centre of the lens aligned with the centre of the test bench. • Stationary overhead with the centre of the lens aligned with the centre of the test bench. • Stationary oblique to provide an overall front view of the test. • 1000 frames per second.	• Head Acceleration on each of the three axes plus head 3ms resultant and HIC 15 • Chest Acceleration on each of the three axes and chest 3ms resultant • Upper neck forces plus peak +Fz (tension force) • Upper neck moments plus peak Mx (absolute value) • Head retention • Torso retention

11. FRONTAL IMPACT TESTING

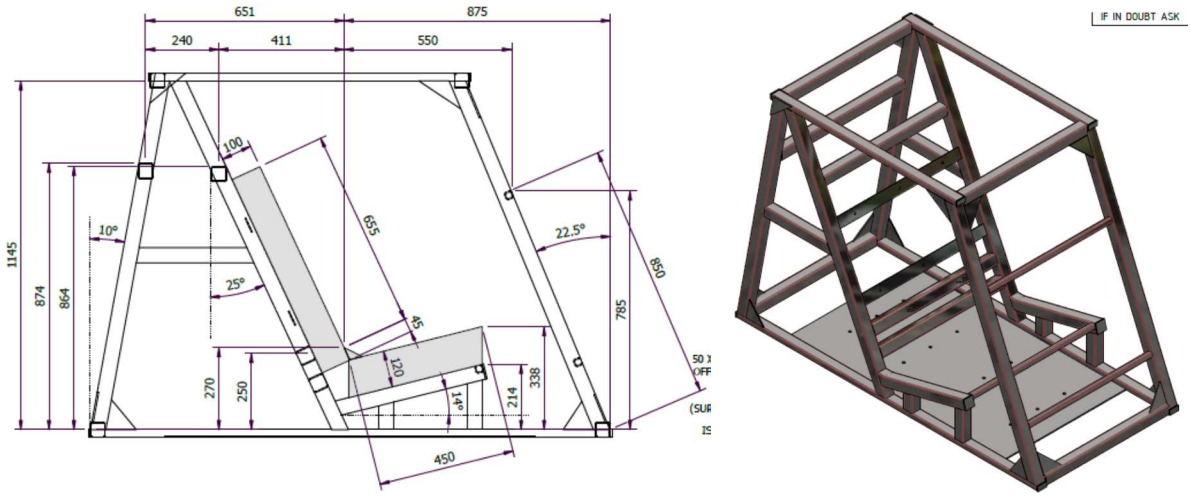


Figure 2. Frontal impact test rig

a. Frontal impact test rig

A test rig shall be constructed from steel structure and a structure for providing seatbelt anchorages with dimensions of which are given in Figure 2

b. Simulated front seat

A simulated front seat shall be constructed from 10 mm aluminium sheet and padded with a neoprene sponge rubber that simulates the lower part of vehicle front passenger/driver seat with the dimension as shown in Figure 3.

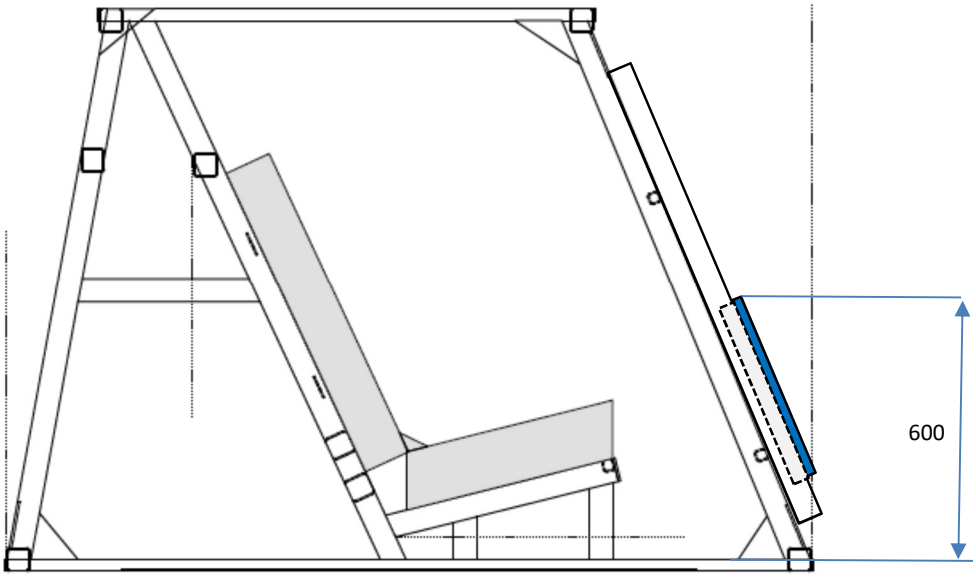


Figure 3. Simulated front seat.

c. Test bench

The test bench shall be constructed as follows:

i. The seat base and back cushions shall be made with polyurethane foam, the characteristics of which are given in Table 1. The dimensions of the cushion are given in Figure 4;
ii. The polyurethane foam shall be covered with fabric designed for automotive application.

Table 1.

Property	**Value**
Density	40kg/m^3
Hardness (IFD 40%N)	230±20
Comfort/Indent Factor	2.2
Resilience Min. %	45

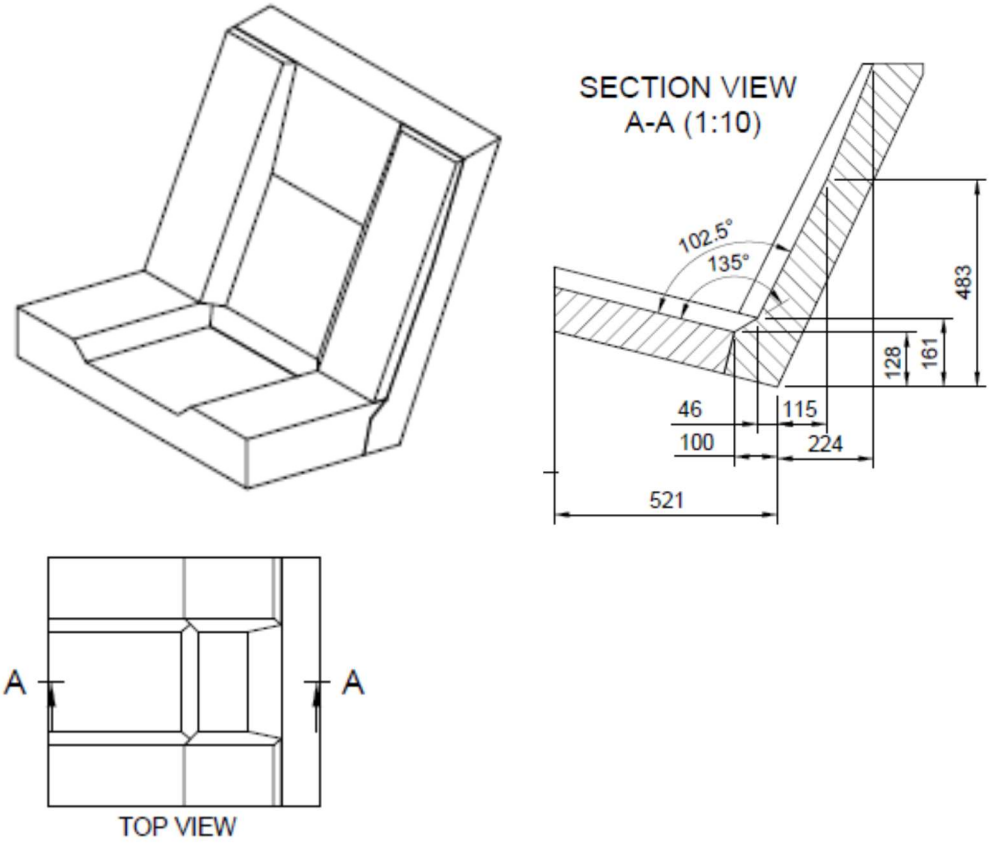


Figure 4. Seat cushion dimensions for frontal impact test rig

12. SIDE IMPACT TESTING

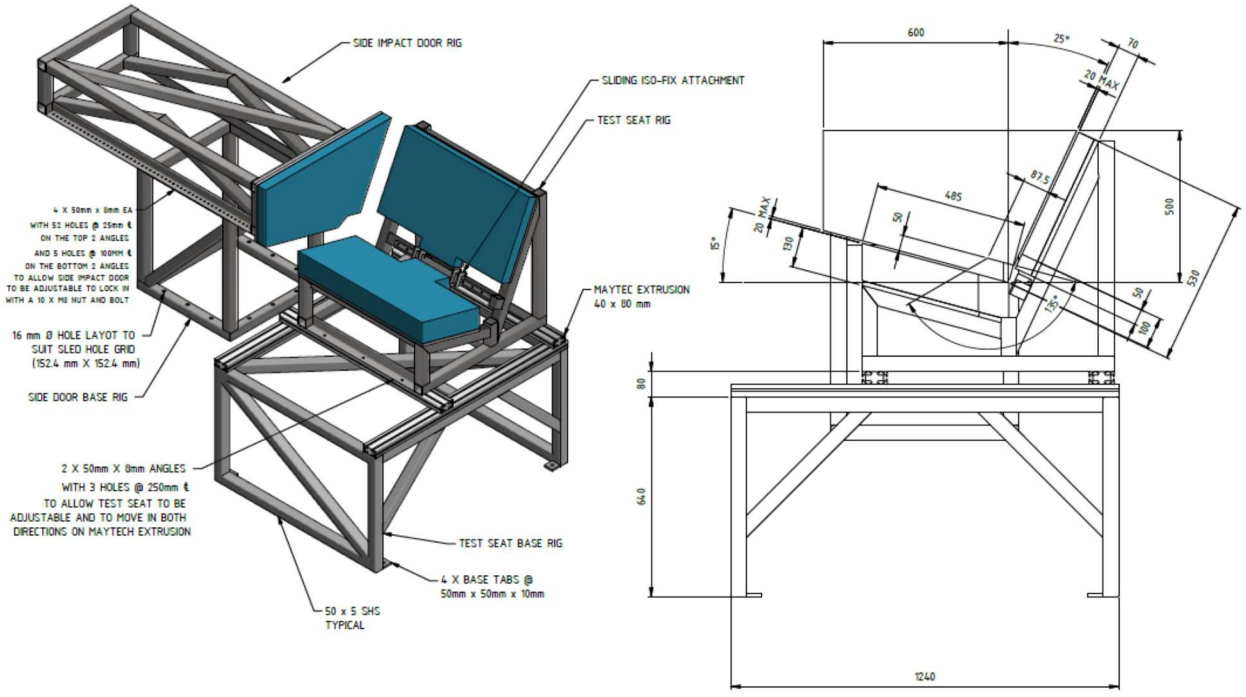


Figure 5. Side impact test rigs

a. Side impact test rigs

i. The side impact test rigs comprise the side impact door rig and the test seat base rig. The test bench is a component of the test seat base rig

ii. The test rigs shall be constructed from steel structure and a structure for providing seatbelt anchorages with dimensions of which are given in Figure 5.

b. Side impact test bench

The test bench shall be constructed as follows:

i. The width of the test bench shall be 800 mm

ii. A rigid back, fixed, dimensions of which are given in Figure 6 below;

iii. Rigid seating, dimensions of which are given in Figure 7. The rear part of the seating is made from a rigid sheet metal.

iv. The seat base and back cushions shall be made with polyurethane foam, the characteristics of which are given in Table 2. The dimensions of the cushion are given in Figure 6;

v. The polyurethane foam shall be covered with fabric designed for automotive application.

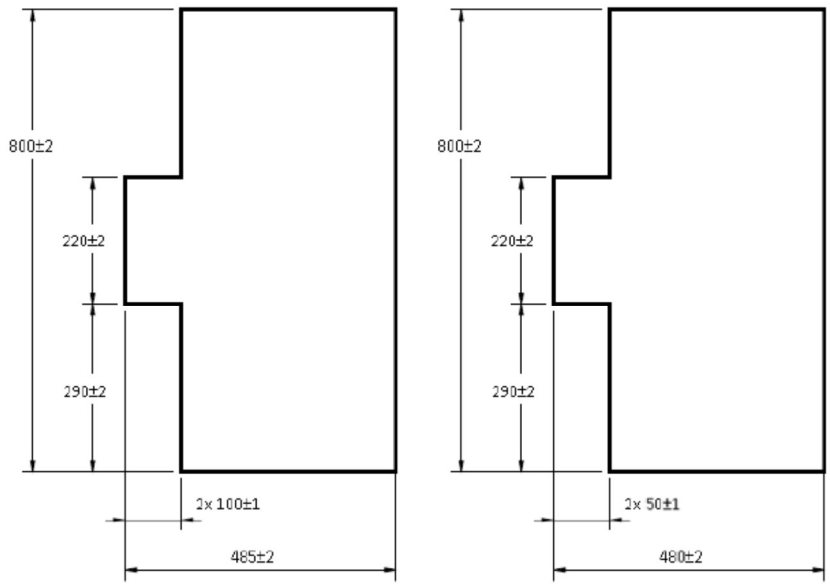
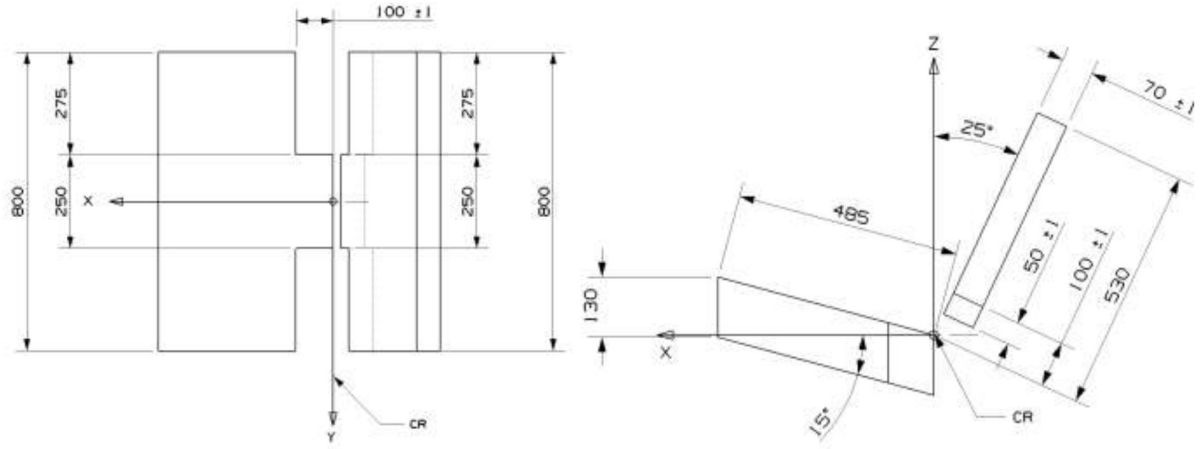


Figure 6. Test bench seat base (left) and back (right) cushions.

Table 2.

Property	**Value**
Density	68-74 kg/m3
Hardness (IFD 40%N)	480 (+/15 %)



Top View Side View
Bench seat cushions (Tolerance general: ±5)

Figure 7. Dimensions of the test bench and the test bench seat cushions

c. Intruding door

The intruding door shall be constructed from 6 mm aluminium sheet and 18 mm plywood as the backing with the dimensions shown in Figure 8. A 50mm neoprene sponge rubber with the same dimensions as the backing shall be attached to the backing.

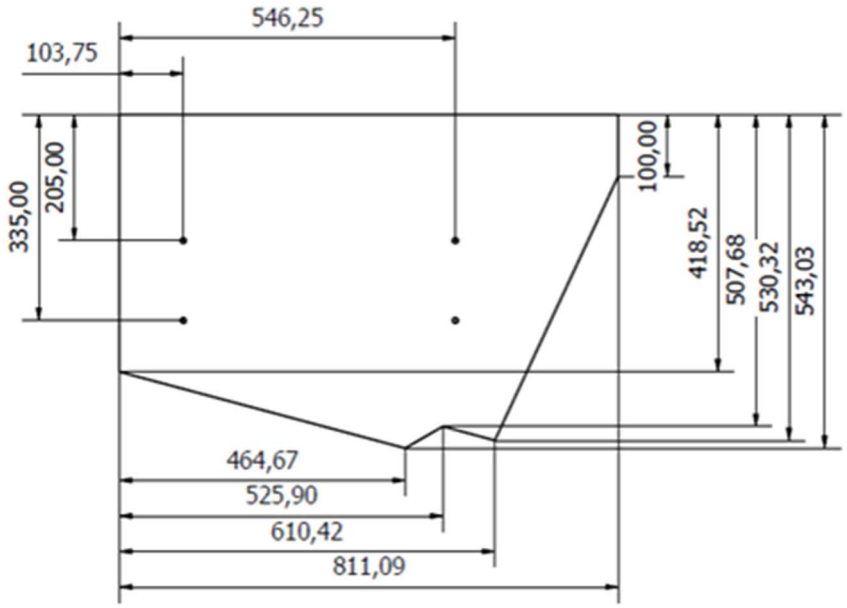


Figure 8. Intruding door dimensions (mm).

13. SET-UP AND TEST PROCEDURES FOR TYPES A1, A2 AND A4 RESTRAINTS

a. Simulated front seat

In all type A1, A2 and A4 CRS testing, the simulated front seat shall be removed.

b. Dummy Selection

Before commencing this procedure, select the test dummy according to either Test Matrix 1, 2 or 3 as applicable and ensure that it is dressed in accordance with Section 15 and calibrated in accordance with the relevant child ATD user documentation.

c. Dynamic Testing Setup for Type A1, Type A2 and A4 CRS

Where a seat belt is intended as part of the restraint system for the CRS:

The test shall be conducted with a length of new seat belt webbing complying to the specifications decribed below and attached to the test rig using the seat belt anchorage geometry specified in Section 16 – ‘Dynamic Testing - ISOFIX Anchorage and Seat Belt and Top Tether Anchorage Point Geometries’.

i. AS/NZS 1753 Class D22
ii. Width of 48 ± 2 mm at 10000 N
iii. Elongation of 8 to 14%
iv. Length of 3200 ± 10 mm

The top tether strap shall be attached to the test rig using the anchorage point geometry specified in Section 16 - 'Dynamic Testing - ISOFIX Anchorage and Seat Belt and Top Tether Anchorage Point Geometries'.

Procedure - Types A1, A2 and A4 Restraints.

a) **For frontal impact test**, attach the ***Frontal Impact Test Seat*** to the sled in the correct position for the required mode of testing.

   For the side impact test, attach the ***Intruding Door*** of the ***Side Impact Test Seat*** to the sled at 90^0 to the forward direction of the sled;

b) For frontal impact test, calibrate the test rig in accor*dance with the calibration procedure set ou*t in AS/NZS 3629.1:2013 to achieve the frontal impact sled pulse and velocity change specified in either Test Matrix 1, 2, or 3, as applicable.

   For side impact testing, calibrate the test rig to achieve the side impact velocity profile specified in either Test Matrix 1, 2, or 3, as applicable.

c) Remove ballast mass from the sled, as appropriate.

d) Place the CRS, or the base when supplied separately, on the test seat with the ***CRS Seating Reference Plane*** aligned with the *Test seat seating reference plane*
e) Attach the seatbelt or lower attachment connectors as applicable, in accordance with the manufacturer's instructions and adjust as follows:
   i. Where a seatbelt is used to secure the CRS:
      1. Tension the seatbelt lap strap, followed by the seatbelt sash strap, by applying a force between 60 N and 80 N to as many points as required. Repeat as necessary.
      2. Tension the upper portion of the seatbelt sash strap rear of the vehicle sash guide, by applying a force between 20 N and 25 N.
      3. Where the CRS incorporates a locking device or mechanism supplied with the CRS fit or activate the device after the strap is tensioned.
   ii. Where flexible ***Lower Attachment Connectors*** are used to secure the CRS:
      1. Place a 20 kg mass on the base of a two-piece restraint or on the seating surface of a one-piece restraint. In both cases, position the mass as close as practicable to the back of the test seat while ensuring it remains fully supported.
      2. Remove any slack from the flexible components and then apply a force between 50 N and 60 N to the free end of the strap through one adjuster and then the other.
      3. Repeat using a force of between 60 N and 70 N
      4. Repeat using a force of between 70 N and 80 N four more times, alternating between each strap
      5. Remove the 20 kg mass.
   iii. Where adjustable rigid ***Lower Attachment Connectors*** are used to secure the CRS:
      1. Ensure the base/enclosure is correctly positioned against the back of the test seat and the latching system is correctly engaged.
      2. Mark the base of the CRS on both sides and the adjacent part of test seat seating surface
      3. Mark the seating surface at points 30 mm and 35 mm rearward of the original marks
   iv. Push the CRS rearward until either:

- The marks on its base either align with the 30 mm marks on the seating surface and the adjustment system latches into position at that point, or
- The latching mechanism latches into its rearward most position before the marks on the CRS coincide with the 30 mm marks on the seating surface, or
- Where the marks on the CRS coincide with the 30 mm marks on the seating surface, but the mechanism does not latch, push the CRS beyond the 30 mm to the next latching detent, provided it is not past the 35 mm mark. Where it reaches the 35 mm mark without latching, relax the force on CRS, allowing the latching mechanism to latch at the detent immediately forward of the 30 mm mark

Note: Do not exceed the maximum adjustment force shown in (i) above under any circumstances.

d) If a safety feature is supplied with the CRS and the fitting instructions mandate its use, activate it by following the manufacturer's instruction;

e) Place the dummy in the CRS/enclosure and mark the shoulder strap slots or position to be used. The shoulder straps shall be in the slots or position that are nearest the dummy's shoulder height, but not more than 5 mm below its shoulder height. Remove the dummy and reposition the shoulder straps to the marked shoulder strap slots, if necessary;

f) Place a flexible spacer between the back of the dummy and the seat-back of the CRS. The spacer shall be 25 mm thick and 60 mm wide. The height of the spacer is listed in the table below for the different dummy sizes.

	Q0	Q1	Q3
Height of spacer device for positioning of dummy (mm)	173 ± 5	229 ± 5	250 ± 5

h) Reposition the dummy in the CRS and secure the harness. DO NOT ADJUST THE HARNESS;

i) Remove excess slack from the harness lap strap and shoulder straps and then apply a force of 250 ± 25 N to the adjuster strap to tighten the harness - repeat as necessary then mark the adjuster strap where it exits the adjuster/enclosure. For CRS with a separate capsule adjust the harness externally. For other CRS adjust the harness while the CRS is installed on the test seat ensuring dummy is positioned in accordance with the guidelines.

j) Remove the spacer and push the dummy toward the seat back and distribute the slack evenly throughout the harness.

k) Position the dummy in accordance with the guidelines in *Section 17 - Guidelines on dummy positioning.*

l) Check the position of the top tether anchor fitting is correct and attach the top tether strap;

m) Adjust the top tether strap by removing the slack from the strap;

n) If the CRS is fitted with a carry handle, it is to be positioned in accordance with the manufacturer's instruction. In the absence of such instructions, the handle is to be folded to its 'lowest front position' (i.e. rear with respect to dummy);

o) Set the test rig to the settings established during the calibration of the test rig for the relevant mode of testing;

p) Operate the test rig

q) Check the system post-test and record the following:
   - paint markings (from CRS/dummy's head)
   - complete/partial separation
   - adjuster slippage

14. SET-UP AND TEST PROCEDURES FOR TYPES B AND G CRS

a. Simulated Front Seat

In all type B and G restraint testing, the simulated front seat is to be installed as shown in Figure 3.

b. Dummy Selection

Before commencing this procedure, select the test dummy according to either Test Matrix 4 or 7 as applicable and ensure that it is dressed in accordance with Section 15 'Dynamic Testing – Clothing for Test Dummies' and that it is calibrated in accordance with the relevance child dummies user documentations.

c. Dynamic Testing for Types B and G CRS

Where a seat belt is intended as part of the restraint system for the CRS,

The test is to be conducted with a length of new seat belt webbing complying to the specifications shown below and attached to the test rig using the seat belt anchorage geometry specified in Section 16 – 'Dynamic Testing - ISOFIX Anchorage and Seat Belt and Top Tether Anchorage Point Geometries'.

i. AS/NZS 1753 Class D22
ii. Width of 48 ± 2 mm at 10000 N
iii. Elongation of 8 to 14%
iv. Length of 3200 ± 10 mm

Procedure

a) **For frontal impact test**, attach the ***Frontal Impact Test Seat*** to the sled in the correct position for the required mode of testing.

   For the side impact test, attach the ***Intruding Door*** of the ***Side Impact Test Seat*** to the sled at 90^0 to the forward direction of the sled;

b) For frontal impact test, calibrate the test rig in accor*dance with the calibration procedure set ou*t in AS/NZS 3629.1:2013 to achieve the frontal impact sled pulse and velocity change specified in either Test Matrix 4 or 7, as applicable.

   For side impact testing, calibrate the test rig to achieve the side impact velocity profile specified in either Test Matrix 4 or 7, as applicable.

c) Remove ballast mass from the sled, as appropriate;
d) Place the CRS, or the base when supplied separately, on the test seat with the ***CRS Seating Reference Plane*** aligned with the *Test eat seating reference plane*;

Note: If the front of the CRS base cannot make contact with the test bench and leaving a gap of more than 25 mm, adjust the reclining to ensure the CRS base is in full contact with the test bench.

e) Attach the seatbelt or lower attachment connectors and top tether as applicable, in accordance with the manufacturer's instructions and adjust as follows:
    i. Where a seatbelt is used to secure the CRS:
        1. Tension the seatbelt lap strap, followed by the seatbelt sash strap, by applying a force between 60 N and 80 N to as many points as required. Repeat as necessary.
        2. Tension the upper portion of the seatbelt sash strap rear of the vehicle sash guide, by applying a force between 20 N and 25 N.
        3. Where the CRS incorporates a locking device or mechanism supplied with the CRS fit or activate the device after the strap is tensioned.
    ii. Where flexible ***Lower Attachment Connectors*** are used to secure the CRS
        1. Place a 20 kg mass on the base of a two-piece restraint or on the seating surface of a one-piece restraint. In both cases, position the mass as close as practicable to the back of the test seat while ensuring it remains fully supported.
        2. Remove any slack from the flexible components and then apply a force of between 50 N and 60 N to the free end of the strap through one adjuster and then the other.
        3. Repeat the loading procedure twice more, first using a force of between 60N and 70 N.
        4. Repeat using a force of between 70N and 80N four more times alternating between each strap.
        5. Then remove the 20kg mass.
    iii. Where rigid ***Lower Attachment Connectors*** are used to secure the CRS:
        1. Ensure the base/enclosure is correctly positioned against the back of the test seat and the latching system is correctly engaged;
        2. Mark the base of the CRS on both sides and the adjacent part of test seat seating surface;
        3. Mark the seating surface at points 30 mm and 35 mm rearward of the original marks
    iv. Push the CRS rearward until either:
        1. The marks on its base either align with the 30 mm marks on the seating surface and the adjustment system latches into position at that point, or
        2. The latching mechanism latches into its rearward most position before the marks on the CRS coincide with the 30 mm marks on the seating surface, or
        3. Where the marks on the CRS coincide with the 30 mm marks on the seating surface, but the mechanism does not latch, push the CRS beyond the 30 mm to the next latching detent, provided it is not past the 35 mm mark. Where it reaches the 35mm mark without latching, relax the force on CRS, allowing the latching mechanism to latch at the detent immediately forward of the 30 mm mark.

    Note: Do not exceed the maximum adjustment force shown in (i) above under any circumstances.

f) If a safety feature is supplied with the CRS and the fitting instructions mandate its use, activate it by following the manufacturer's instruction;

g) Adjust the top tether strap by removing the slack from the strap;

h) Select the test dummy according to either Test Matrix 4 or 7 as applicable.

For frontal impact test

Place the dummy in the CRS/enclosure and mark the shoulder strap slots or position to be used. The shoulder straps shall be in the slots or position that are nearest the dummy's shoulder height, but not more than 25 mm below its shoulder height. Remove the dummy and reposition the shoulder straps to the marked shoulder strap slots, if necessary;

For side impact tests,

Place a height spacer applicable to the dummy (25 mm height spacer for Q3 or 45mm spacer for Q6) on the seating surface of the CRS;

Place the dummy on the height spacer and in the CRS and mark the shoulder strap slots to be used. The shoulder straps shall be in the slots that are nearest the dummy's shoulder height, but not more than 25mm below its shoulder height. Remove the dummy and reposition the shoulder straps to the marked shoulder strap slots, if necessary;

i) Place a flexible harness spacer between the back of the dummy and the seat-back of the CRS. The spacer shall be 25 mm thick and 60 mm wide. The height of the spacer is listed in the table below for the different dummy sizes.

	Q1	Q3	Q6
Height of harness spacer for positioning of dummy (mm)	229 ± 5	250 ± 5	270 ± 5

j) Reposition the dummy in the CRS and secure the harness. DO NOT ADJUST THE HARNESS;

k) Remove excess slack from the harness, lap strap and shoulder strap and then apply a force of 250 ± 25 N to the adjuster strap to tighten the harness - repeat as necessary, then mark the adjuster strap where it exits the adjuster/enclosure.

l) Remove the harness spacer and push the dummy toward the seat back and distribute the slack evenly throughout the harness.

m) Position the dummy in accordance with the guidelines in *Section 17 - Guidelines on dummy positioning.*

n) Set the test rig to the settings established during the calibration of the test rig for the relevant mode of testing;

o) Operate the test rig, and

p) Check the system post-test and record the following:
   1. dummy retention (whether any harness straps have come off the shoulder)
   2. paint markings (from CRS/dummy's head)
   3. complete/partial separation
   4. adjuster slippage

15. SET-UP AND TEST PROCEDURES TYPES E AND F CRS

a. Simulated Front Seat

In all type E and F CRS testing, the simulated front seat shall be installed as per Figure 3.

b. Dummy Selection

Before commencing this procedure, select the test dummy according to either Test Matrix 5 or 6, as applicable, and ensure that it is dressed in accordance with Section 15 – 'Clothing For Test Dummies' and that it is calibrated in accordance with the relevance child dummies user documentations. Paint the head of the dummy, as appropriate (see Section 15).

c. Dynamic Testing of Types E and F CRS

The test is to be conducted with a length of new seat belt webbing complying to the specifications shown below and attached to the test rig using the seat belt anchorage geometry specified in Section 16 – 'Dynamic Testing - ISOFIX Anchorage and Seat Belt and Top Tether Anchorage Point Geometries'.

i. AS/NZS 1753 Class D22
ii. Width of 48 ± 2 mm at 10000 N
iii. Elongation of 8 to 14%
iv. Length of 3200 ± 10 mm

The top tether strap, if supplied, shall be attached to the test rig using the anchorage point geometry specified in Section 16 – 'Dynamic Testing - Isofix Anchorage and Seat Belt and Top Tether Anchorage Point Geometries'.

Procedure

a) **For frontal impact test**, attach the ***Frontal Impact Test Seat*** to the sled in the correct position for the required mode of testing.

   For the side impact test, attach the ***Intruding Door*** of the ***Side Impact Test Seat*** to the sled at 90^0 to the forward direction of the sled;

b) Attach a length of seat belt webbing, using the relevant seat belt anchorage geometry specified in either;

   (i) Figure 1 Section 16 - 'Dynamic Testing - Isofix Anchorage and Seat Belt and Top Tether Anchorage Point Geometries, for the frontal test;

   (ii) Figure 2 Section 16 - 'Dynamic Testing - Isofix Anchorage and Seat Belt and Top Tether Anchorage Point Geometries', for the side impact.

c) **For frontal impact test**, calibrate the test rig in accordance with the calibration procedure set out in AS/NZS 3629.1:2013 to achieve the frontal impact test sled pulses and velocity changes specified in either Test Matrix 5 or 6, as appropriate;

For side impact testing, calibrate the test rig to achieve the side impact velocity profile specified in either Test Matrix 5 or 6 as applicable.

d) Remove ballast mass from the sled, as appropriate;

e) Place the CRS on the test seat with the ***CRS Seating*** *Reference Plane*

Note: If the front of the CRS base cannot make contact with the test bench and leaving a gap of more than 25 mm, adjust the reclining to ensure the CRS base is in full contact with the test bench.

f) If a safety feature is supplied with the CRS and the fitting instructions mandate its use, activate it by following the manufacturer's instruction;

g) If a top tether strap is supplied with the CRS, couple the CRS to the child restraint anchorage point as instructed by the manufacturer.

h) Adjust the top tether strap, where applicable, by removing the slack from the strap.;

i) Select the test dummy according to either Test Matrix 5 or 6 as applicable.

For frontal impact tests,

Place the test dummy in the CRS and couple the seat belt about it;

For side impact tests,

Place a height spacer applicable to the dummy (25 mm height spacer for Q3 or 45 mm spacer for Q6 or none for Q10) on the seating surface of the CRS;

Place the dummy on the height spacer and in the CRS and couple the seat belt about it;

1. Tension the seatbelt lap strap, followed by the seatbelt sash strap, by applying a force between 60 N and 80 N to as many points as required. Repeat as necessary.
2. Tension the upper portion of the seatbelt sash strap rear of the vehicle sash guide, by applying a force between 20 N and 25 N.
3. Where the CRS incorporates a locking device or mechanism supplied with the CRS fit or activate the device after the strap is tensioned.

j) Position the dummy in accordance with the guidelines in *Section 17 - Guidelines on dummy positioning*

k) Check that the seat belt sash strap is across and in contact with the shoulder and upper torso of the dummy. NOTE: WHERE A SASH GUIDE IS PROVIDED, IT IS TO BE USED UNLESS OTHERWISE INSTRUCTED BY THE MANUFACTURE;

l) Set the test rig to the settings established during the calibration of the test rig for the relevant mode of testing. Operate the test rig, and,

p) Check the system post-test for compliance or otherwise with the performance aspects listed in the relevant table from the Assessment Protocols and record the results. Examples of the assessments needed are:
- Dummy retention;

- CRS breakage and/or separation or partial separation of load bearing components;
- Seat belt/sash guide separation or non-separation, and
- Sash strap across and in contact or otherwise with the shoulder and torso of the test dummy, etc.

16. DUMMY PREPARATION

Six test dummies are to be used for testing different Type categories of CRS. These are the:

- Q0 (Type A1, A2 and A4 devices)
- Q1 (Type A2, B and G devices);
- Q3 (Types A4, B, E and F;
- Q6 (Types E and G devices), and
- Q10 (Types F devices).

a. Clothing for Test Dummies

Each of the test dummies shall be clothed using their standard neoprene suit supplied.

b. Neck and hip shields

Neck and hip shields shall be installed in Q10 dummy and only neck shield to be installed in Q6 dummy.

c. Dummy Test Conditions

- All the test dummies shall have a stabilised temperature, measured in the testing room of 18ºC to 25ºC, for at least 30 minutes immediately prior to the test.
- The temperature of the dummies shall be measured for at least 1 hour before test at intervals not exceeding 10 minutes and not exceeding 5 minutes before test.
- Test to be conducted within 30 minutes of dummy installation.

d. Dummy painting

The dummies shall have masking tape placed on the dummy's head to be painted using a contrasting colour with the size and placement as specified below. The tape should be completely covered with the following coloured paints. The paint shall be applied close to the time of the test to ensure that the paint will still be wet on impact.

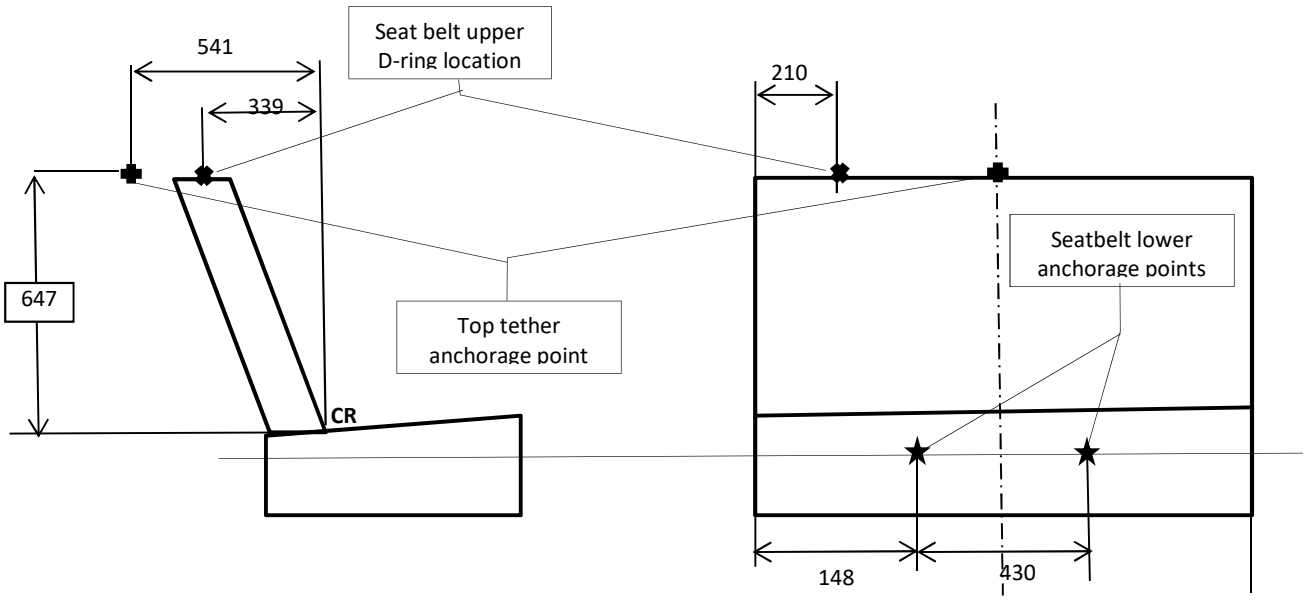
<u>For frontal tests</u>
A strip of masking tape with nominal width of 25mm extending at least from the dummy's forehead to the back of the head.

<u>For side impact test</u>
A strip of masking tape with nominal width of 25mm extending at least from the dummy's left ear to the right ear.

17. DYNAMIC TESTING - ISOFIX ANCHORAGE AND SEAT BELT AND TOP TETHER ANCHORAGE POINT GEOMETRIES

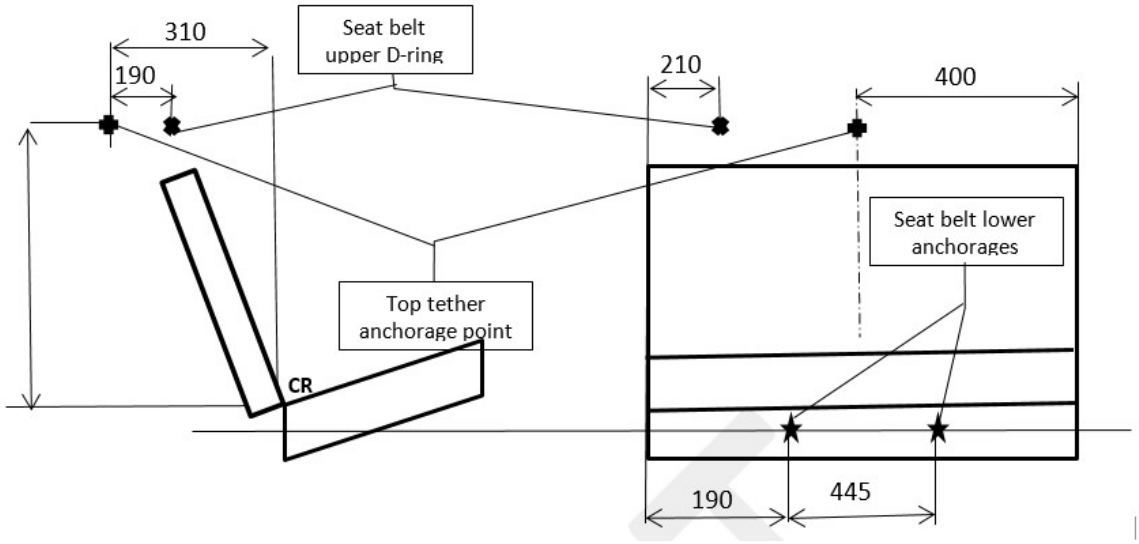
The seat belt, ISOFix and top tether anchorage point geometries for frontal impact testing are shown in Figures 9 and 10, respectively.

The ***ISOFIX Low Anchorage*** geometries for frontal and side impact testing are shown in Figures 8 and 9 respectively



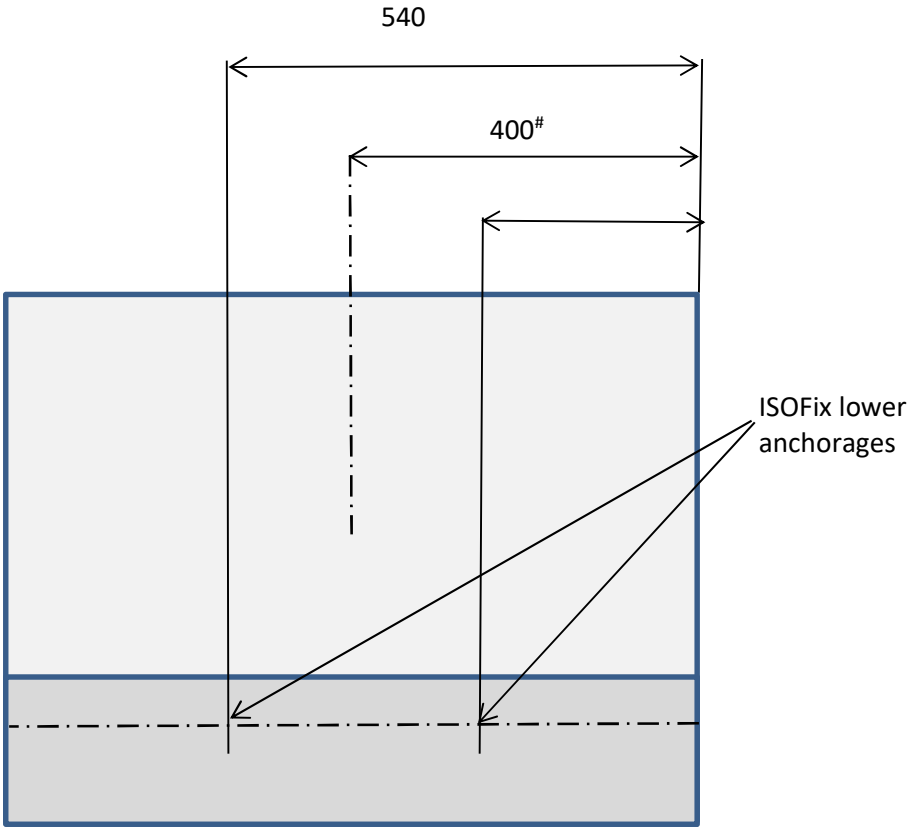
All dimensions in mm Drawing not to scale

Figure 9. Seat Belt, Top Tether Anchorage Point Geometries – Frontal Testing



All dimensions in mm drawing not to scale

Figure 10. Seat belt and Top Tether Anchorage Point Geometries – Side Impact testing



Test Seat - Front Elevation

All dimensions in mm Drawing not to scale

*: Distance to the midpoint along the ***ISOFIX Interface Surface***
#: Position of ***top tether anchorage point***

Figure 11. *ISOFIX Low Anchorage* and Top Tether Anchorage Point Positions - Frontal Testing

The ***ISOFIX Low Anchorages*** shall be the same length as those specified in AS/NZ 1754:2013, but their ***Interface surfaces*** shall not more than 58mm, nor less than 53mm rearward of the seat bight of the test seat. The longitudinal centre lines of the anchorages shall be in the same horizontal plane as the seat bight.

The ***ISOFIX Low Anchorages*** shall be inspected following each test in which they are involved and repaired or replaced, as appropriate, if damaged.

18. GUIDELINES ON DUMMY POSITIONING

a. General

- Head: Allow the head to rest naturally (no adjustment).
- Torso: Ensure that the dummy's lower back is in contact with the CRS seat back.
- Limbs: With exception of Q0, limbs shall be positioned symmetrically

b. Q0, Q1 and Q3 installation in rearward facing modes

Legs

- Position the femurs forward with a distance (y-axis) between the centres of the knees as shown in the Table below. If the CRS prevents this gap from being achieved, position the knees as close to the target values as possible.
- Where possible, allow the lower legs to rest naturally. The tibias shall be parallel to the vehicle centreline (x-axis) and the feet shall be separated by the same distance as the knees (except for Q3).
- For Q3 dummy to be positioned in Type A4 CRS, place the feet straight up and rest on the seat back and adjust the distance between the centre of knees and the centre of the feet as shown in Table below. However, if the feet are in contact with the top tether straps, adjust the feet to avoid the contact.

	Q0	Q1	Q3
Distance between the centre of the knees	Naturally	120 ± 5	130 ± 5
Distance between the centre of the feet	Naturally	120 ± 5	130 ± 5

Arms

- The upper arms shall be positioned parallel to the chest.
- The lower arms shall be positioned:
    - To rest naturally for Q0
    - Parallel to the upper legs for Q1. If the lower arms keep falling preventing this position being achieved, position the lower arms close to the target values as possible

c. Q1, Q3, Q6 and Q10 installation in forward-facing and booster seat modes

Arms

- The upper arm shall be positioned parallel to the chest.
- Position the lower arms parallel to the upper legs but they are allowed to drop resting on the area between the upper legs and the CRS.

Legs

- Position the femurs with a distance of between the centres of the knees as shown in Table below. If the CRS prevents this gap from being achieved, position the knees as close to the target values as possible.
- Where possible, allow the lower legs to rest naturally with the tibias parallel to the CRS seating reference plane.

	Q1	Q3
Distance (y-axis) between the centre of the knees	120 ± 5	130 ± 5

d. Q6 and Q10 installation

- Ensure that the dummy's upper back is in contact with the CRS seat back. This is done by bending the dummy's back into an upright position and then pushing the pelvis backwards.
- Ensure that the dummy is seated on the centreline of the CRS and is not rotated about the vertical axis.
- Push the dummy's shoulders toward the CRS until either the shoulders contact the CRS booster seat back.
- Ensure that the dummy remains sitting in an upright position and remains aligned with the seat centreline.

Leg

- Position the femurs straight forward with a distance of 140mm ±5mm (for Q6) or 150mm ±5mm (for Q10) between the centres of the knees. If the CRS prevents this gap from being achieved, position the knees as close to the target values as possible.
- Where possible, allow the lower legs to rest naturally with the tibias parallel to the CRS seating reference plane

Arms

- The upper arm shall be positioned parallel to the chest.
- Position the lower arms parallel to the upper legs resting on the booster or armrest as close as possible to the side of the femur. The elbows shall be kept as close as possible to the torso.