

CHILD RESTRAINT EVALUATION PROGRAM

SERIES 7

SCORING PROTOCOLS AND RULES

(Incorporating Amendments No 1 – 23 April 2021 and No 2 – 17 March 2023)

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Child Restraint Evaluation program

Stage 7

Scoring Protocols and Rules

1. INTRODUCTION

A review has been completed of the Child Restraint Evaluation Program (CREP), with the outcome being a recommendation, accepted by the CREP Partners, to expand the Program to more thoroughly examine the side and frontal impact performance of child restraint systems (CRS). This has resulted in the need to review and revise the scoring protocols, the test specifications and the test procedures. This document sets out the revised scoring protocols and specific rules regarding CRS performance.

2. 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.

CRS Interfaces

- A2 |
- The interfaces are any of the following: the two ISOFIX anchorages, seat belt anchorages, top tether anchorage or, in the case of CRS with a separate base, any other means of attaching the CRS to the base.

Dummy measurements

- A2 |
- All dummy measurements (head, neck and chest) are measured during the *Impact Phase* unless specified otherwise.

Forward Head Excursion

- A2 |
- Maximum horizontal (x-axis) head excursion measured from the *seat bight* to the dummy's head centre of gravity. When using a Q6 dummy, 80mm is added to the measured value.

Impact phase

- **In frontal test.** The *impact phase* in the frontal impact test is defined by a period of time starting from time zero and ending at the point in time where the head acceleration in the x direction (Head g_x) crosses zero after the acceleration peak value. See Figure 1.
- **In side impact test.** The *impact phase* in the side impact test is defined by a period of time starting from time zero and ending at the point in time where the head acceleration in the y direction (Head g_y) crosses zero after the acceleration peak value. See Figure 2.

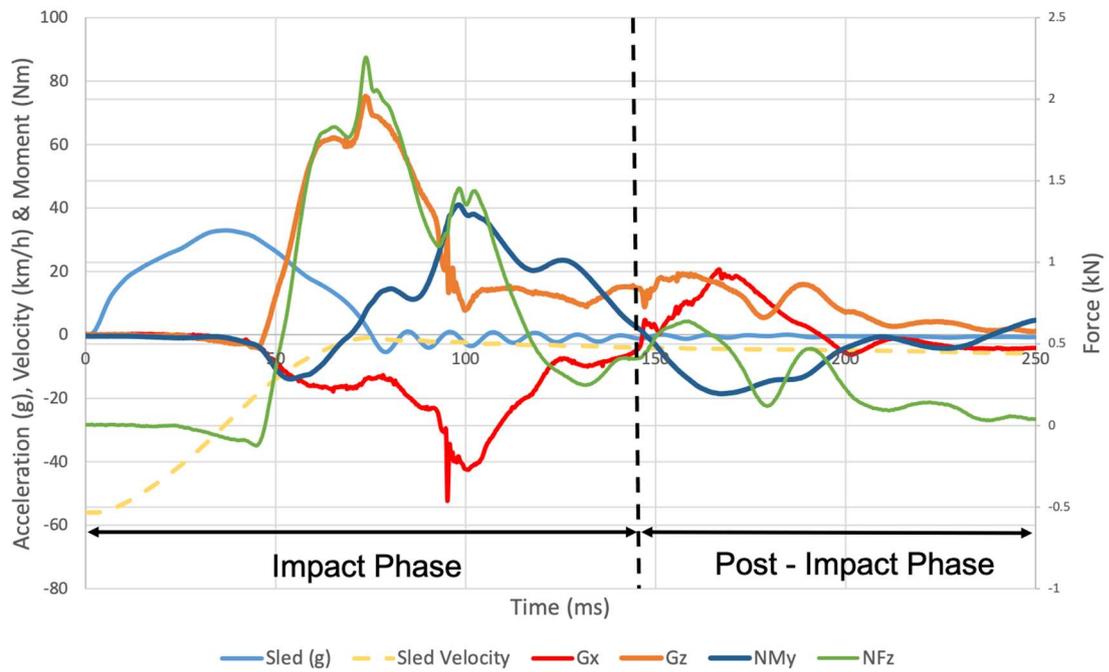


Figure 1: Example of *Impact phase* and *Post-impact phase* in frontal impact test

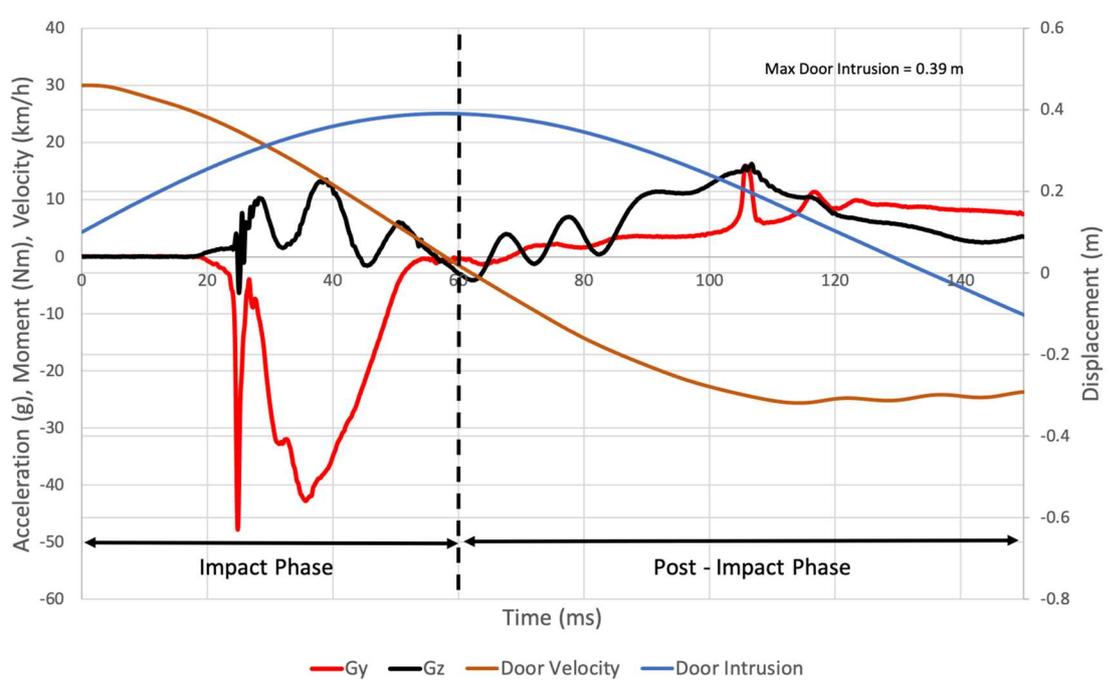


Figure 2: Example of *Impact phase* and *Post-impact phase* in side impact test

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 ear 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.

Post-impact phase

- **In frontal test.** The *post-impact phase* of the frontal impact test is defined by a period of time starting from the completion of the impact phase in the frontal test and ending at the point in time where the head acceleration in the x direction (Head g_x) crosses zero after the secondary acceleration peak value. See Figure 1
- **In side impact test.** The *post-impact phase* of the side impact test is defined by a period of time starting from the completion of the *impact phase* in the side impact test and ending at the point in time where the head acceleration in the y direction (Head g_y) crosses zero after the secondary acceleration peak value. See Figure 2.

Seat bight

- The intersection of the seat back cushion and seat base cushion on the test bench.

Submarining

- The dummy moves forward and down during the *impact phase* of the test so that the seat belt lap strap is repositioned from the dummy's lower pelvic/upper leg region onto the lower abdomen.

Upward Head Excursion

- Maximum vertical (z-axis) head excursion measured from the *seat bight* to the uppermost part of the head observed from the stationary rear camera.

3. Scoring Protocols – Dynamic Testing

3.1. The overall score of CRS mode

A2 | The overall score of the CRS mode is the average score of two impact tests for Types A1, E and F or three impact tests for Types A2, A4 B and G.

3.2. Dummy Ejection

If the dummy is ejected from the CRS at any time during the test that CRS is rated **zero star** for its dynamic performance in front and side impact.

3.3. Restraint retention

If the CRS is partially or wholly unrestrained by any of the interfaces at any time during the test, that CRS is limited to **one star** rating for its dynamic performance in front and side impact.

3.4. Failure of restraint system components

Failure of the restraint system components will be evaluated at any time throughout both the front and side impacts.

- a) There is any breakage or fracturing of load-bearing parts of the belt system including buckles, webbing and anchorage points.
- b) There is any breakage or fracturing of any tethers, straps, ISOFIX anchorages or any other attachments which are specifically used to anchor the CRS to the vehicle fail.
- A2 | c) Adjustable shoulder strap mechanism moves more than 60 mm from the original position.
- d) Complete back/base separation on booster seats.

A CRS experiencing any failure to its restraint system components will be limited to an overall score of one star rating and the numerical star rating limited to maximum of 1.9 stars.

3.5. Head contact

a. Head contact with the test rig

If there is head contact with any part of the test rig, including the roof, the simulated front seat and the intruding door, at any time throughout the test, the CRS is awarded zero points for its head performance in that test.

b. Hard head contact with CRS in *post-impact phase* of frontal test in Types B, G, E and F CRS

A1 | During the *post-impact phase*, a hard head contact can occur. Hard head contact with the CRS in *post-impact phase* of frontal test is defined by peak resultant head acceleration greater than 80 g. In the presence of hard head contact with the CRS, the total score of the CRS in that impact test is reduced by 2 (two) points. An example of the presence of this hard contact is shown in a chart in Figure 3 where the hard head contact is evidenced with the increase in the head resultant acceleration above 80g.

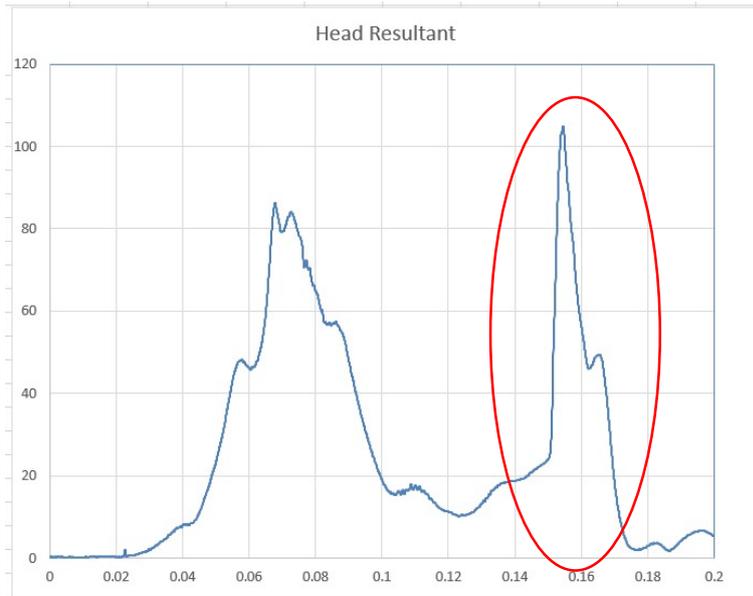


Figure 3: An example of hard head contact with CRS in *post-impact phase*

3.6. Head Containment in Frontal Test

For rearward facing CRSs:

The dummy's head shall remain wholly contained within the perimeter (rearmost head supporting structure) of that part of the CRS surrounding it (Figure 4), during the *impact phase* of the frontal test, when observed using the overhead view camera.

A2 |

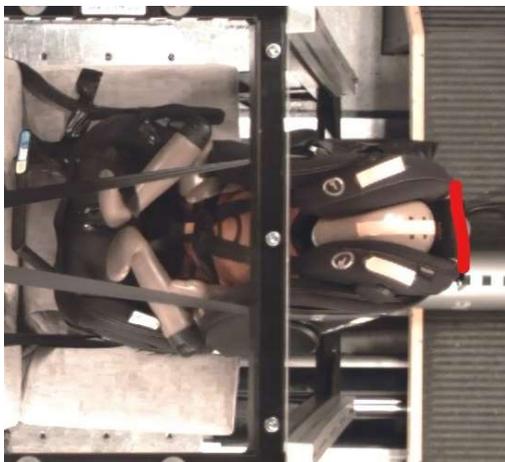
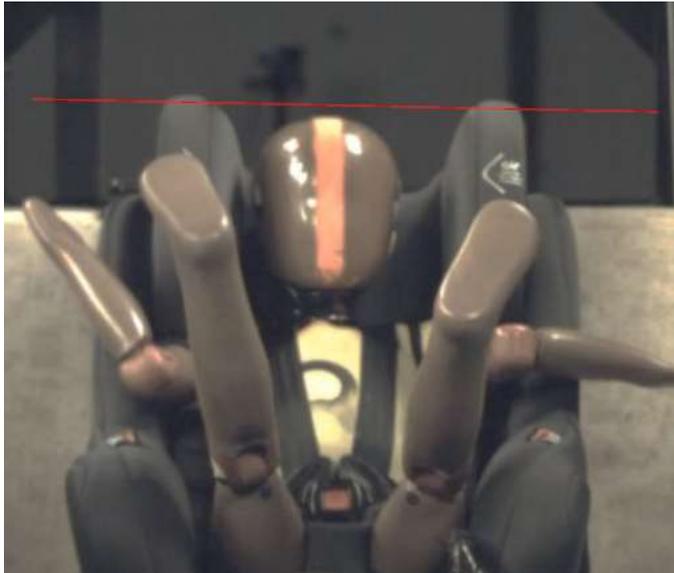


Figure 4: Perimeter surrounding the dummy's head in a rearward facing CRS

For forward facing CRSs:

The dummy's head shall remain wholly contained below the perimeter (uppermost head supporting structure) of that part of the CRS surrounding it (Figure 5) at the completion of the *post-impact phase* of the frontal test, when observed using the front 800mm plane view camera.

A2 |



A2 |

Figure 5: Perimeter surrounding the dummy’s head in a forward-facing CRS at the completion of the *post-impact phase*

3.7. Head Containment in Side Impact Test

“Contained” requires that some energy absorbing section of the side wing remains between the head and a virtual intruding vertical plane, representing the side structure of the vehicle. There shall be no fracturing of the CRS which might compromise the performance of the side wing of the CRS.

A2 |

The head containment for side impact testing shall be assessed before testing. The assessment is to evaluate that no part of the head is horizontally above the highest point of the headrest or the head supporting structure. If any part of the head is above the highest point of the headrest or the head supporting structure, the head containment of the CRS is awarded zero point.

The head containment for side impact testing is also assessed during the *impact phase* of the test whereby the dummy’s head shall not contact the door. If the head contacts the door, the head containment of the CRS is awarded zero point.

3.8. Torso Retention in Frontal and Side Impacts

For Types A1, A2, A4, B and G CRS

The dummy’s torso retention is awarded four points if the torso remains wholly restrained by the harness during the test.

A2 |

The dummy’s torso retention is awarded one point if any of the harness shoulder straps moves off the shoulder during the test. Examples of the torso partially restrained in side impacts are shown in Figures 6a and 6b.

The dummy’s torso retention is awarded zero points if the torso comes free of the harness during the test.

For Types E and F CRS

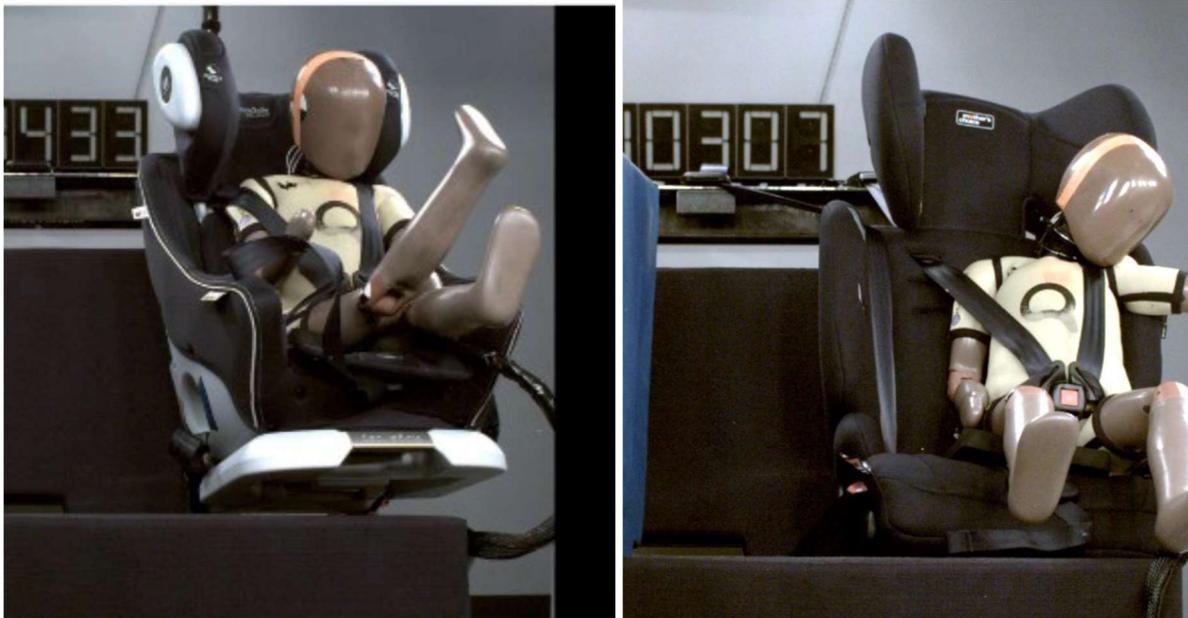
The dummy's torso retention is awarded four points if the torso remains wholly restrained by the seat belt sash strap during the *impact phase* of the test.

A2 | "Torso is wholly restrained" is where the seatbelt sash belt remains on the upper surface of the dummy's shoulder.

A2 | The dummy's torso retention is awarded one point if the seat belt sash strap moves off the shoulder onto the upper arm during the *impact phase* of the test.

The dummy's torso retention is awarded zero point if the torso comes free of the seat belt sash strap during the *impact phase* of the test.

A2 |



Figures 6a and 6b: Examples of the torso partially restrained

4. Scoring for Rearward Facing Child Restraint Systems - Types A1

A1 & A2 |

a. Frontal Impact

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|-------------------------|--------------------------------|--|--|--|---------------------|
| | | 4 | 1 | 0 | |
| Head containment | | The dummy's head remains wholly within the perimeter of that part of the CRS surrounding it, during the <i>impact phase</i> of the test. | | Any part of the dummy's head is exposed outside the perimeter of that part of the CRS surrounding it, during the <i>impact phase</i> of the test | 2 |
| Torso Retention | | The dummy's torso is wholly restrained by the harness during the test | The dummy's torso is only partially restrained by the harness during the test (only one shoulder restrained) | The dummy's torso is substantially unrestrained by the harness during the test (both shoulders unrestrained) | 1 |
| Upward Head Excursion | | 4 points < 650mm from CR point; 0 point > 800mm from CR point (sliding scale) 0 point if the dummy's head passes either through the roof or the seat back cushion planes during the rebound phase of the test | | | 2 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q0 dummy: 4 points ≤ 79; 0 point ≥ 97 | | | 2 |
| Chest | Resultant 3ms acceleration (g) | Q0 dummy: 4 points ≤ 41; 0 point ≥ 55 | | | 1 |
| Maximum score | | | | | 32 |

b. Side impact

A1 & A2 |

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|-------------------------|--------------------------------|---|--|--|---------------------|
| | | 4 | 1 | 0 | |
| Head Containment | | The dummy's head remains wholly below the perimeter before the test and does not strike the door during the <i>impact phase</i> of the test | | Any part of the dummy's head is above the perimeter before the test or strikes the door during the <i>impact phase</i> of the test | 2 |
| Torso Retention | | The dummy's torso is wholly restrained by the harness during the test | The dummy's torso is only partially restrained by the harness during the test (only one shoulder restrained) | The dummy's torso is substantially unrestrained by the harness during the test (both shoulders unrestrained) | 1 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q0 dummy: 4 points ≤ 55; 0 point ≥ 75 | | | 2 |
| Chest | Resultant 3ms acceleration (g) | Sliding scale: Q0 dummy: 4 points ≤ 41; 0 point ≥ 67 | | | 1 |
| Maximum score | | | | | 24 |

5. Scoring for Rearward Facing Child Restraint Systems - Types A2

A1 & A2 |

a. Frontal Impact

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|------------------------------|---------------------------------------|--|--|--|---------------------|
| | | 4 | 1 | 0 | |
| Head containment | | The dummy's head remains wholly within the perimeter of that part of the CRS surrounding it, during the <i>impact phase</i> of the test. | | Any part of the dummy's head is exposed outside the perimeter of that part of the CRS surrounding it, during the <i>impact phase</i> of the test | 2 |
| Torso Retention | | The dummy's torso is wholly restrained by the harness during the test | The dummy's torso is only partially restrained by the harness during the test (only one shoulder restrained) | The dummy's torso is substantially unrestrained by the harness during the test (both shoulders unrestrained) | 1 |
| Upward Head Excursion | | 4 points < 650mm from CR point; 0 point > 800mm from CR point (sliding scale) 0 point if the dummy's head passes either through the roof or the seat back cushion planes during the rebound phase of the test | | | 2 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: For Q0 dummy: 4 points ≤ 79; 0 point ≥ 97 For Q1 dummy: 4 points ≤ 67; 0 point ≥ 82 | | | 2 |
| Neck | +Fz; Upper neck tension (kN) | Sliding scale: Q0 dummy: N/A. Q1 dummy: 4 points ≤ 0.9 ; 0 point ≥ 1.2 | | | 1 |
| | -My; Upper neck extension moment (Nm) | Sliding scale: Q0 dummy: N/A; Q1 dummy: 4 points ≤ 36 ; 0 point > 36 | | | 0.5 |
| Chest | Resultant 3ms acceleration (g) | For Q0 and Q1 dummies: 4 points ≤ 41; 0 point ≥ 55 | | | 1 |
| Maximum score | | Frontal test using Q1 | | | 38 |
| | | Frontal test using Q0 | | | 32 |

b. Side impact

A1 & A2 |

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|-------------------------|--------------------------------|---|--|--|---------------------|
| | | 4 | 1 | 0 | |
| Head Containment | | The dummy's head remains wholly below the perimeter before the test and does not strike the door during the <i>impact phase</i> of the test | | Any part of the dummy's head is above the perimeter before the test or strikes the door during the <i>impact phase</i> of the test | 2 |
| Torso Retention | | The dummy's torso is wholly restrained by the harness during the test | The dummy's torso is only partially restrained by the harness during the test (only one shoulder restrained) | The dummy's torso is substantially unrestrained by the harness during the test (both shoulders unrestrained) | 1 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q1 dummy: 4 points ≤ 55; 0 point ≥ 75 | | | 2 |

| | | | |
|----------------------|---------------------------------|--|-----------|
| Neck | Upper neck resultant force (kN) | Sliding scale: Q1 dummy: 4 points \leq 1.3 ; 0 point \geq 2.4 | 1 |
| Chest | Resultant 3ms acceleration (g) | Sliding scale: Q1 dummy: 4 points \leq 41; 0 point \geq 67 | 1 |
| Maximum score | | | 28 |

6. Scoring for Rearward Facing Child Restraint Systems - Types A4

A1 & A2 |

a. Frontal Impact

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|------------------------------|---------------------------------------|--|--|--|---------------------|
| | | 4 | 1 | 0 | |
| Head containment | | The dummy's head remains wholly within the perimeter of that part of the CRS surrounding it, during the <i>impact phase</i> of the test. | | Any part of the dummy's head is exposed outside the perimeter of that part of the CRS surrounding it, during the <i>impact phase</i> of the test | 2 |
| Torso Retention | | The dummy's torso is wholly restrained by the harness during the test | The dummy's torso is only partially restrained by the harness during the test (only one shoulder restrained) | The dummy's torso is substantially unrestrained by the harness during the test (both shoulders unrestrained) | 1 |
| Upward Head Excursion | | 4 points < 650mm from CR point; 0 point > 800mm from CR point (sliding scale) 0 point if the dummy's head passes either through the roof or the seat back cushion planes during the rebound phase of the test | | | 2 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q0 dummy: 4 points \leq 79; 0 point \geq 97 Q3 dummy: 4 points \leq 87; 0 point \geq 100 | | | 2 |
| Neck | +Fz; Upper neck tension (kN) | Sliding scale: Q0 dummy: N/A. Q3 dummy: 4 points \leq 1.3; 0 point \geq 1.7 | | | 1 |
| | -My; Upper neck extension moment (Nm) | Sliding scale: Q0 dummy: N/A. Q3 dummy: 4 points \leq 36 ; 0 point > 36 | | | 0.5 |
| Chest | Resultant 3ms acceleration (g) | For Q0 and Q3 dummies: 4 points \leq 41; 0 point \geq 55 | | | 1 |
| Maximum score | | Frontal test using Q3 dummy | | | 38 |
| | | Frontal test using Q0 dummy | | | 32 |

b. Side impact

A1 & A2 |

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|-------------------------|---------------------------------|---|--|--|---------------------|
| | | 4 | 1 | 0 | |
| Head Containment | | The dummy's head remains wholly below the perimeter before the test and does not strike the door during the <i>impact phase</i> of the test | | Any part of the dummy's head is above the perimeter before the test or strikes the door during the <i>impact phase</i> of the test | 2 |
| Torso Retention | | The dummy's torso is wholly restrained by the harness during the test | The dummy's torso is only partially restrained by the harness during the test (only one shoulder restrained) | The dummy's torso is substantially unrestrained by the harness during the test (both shoulders unrestrained) | 1 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q3 dummy: 4 points \leq 60; 0 point \geq 80 | | | 2 |
| Neck | Upper neck resultant force (kN) | Sliding scale: Q3 dummy: 4 points \leq 1.3; 0 point \geq 2.4 | | | 1 |
| Chest | Resultant 3ms acceleration (g) | Sliding scale: Q3 dummies: 4 points \leq 41; 0 point \geq 67 | | | 1 |
| Maximum score | | | | | 28 |

7. Scoring for Forward Facing Child Restraint Systems - Type B

A1 & A2 |

a. Frontal impact

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|-------------------------------|--------------------------------|--|--|--|---------------------|
| | | 4 | 1 | 0 | |
| Head Containment | | The dummy's head remains wholly below the perimeter of that part of the CRS surrounding it at the completion of the <i>post-impact phase</i> . | | Any part of the dummy's head is exposed above the perimeter of that part of the of the CRS surrounding it, at the completion of the <i>post-impact phase</i> , | 2 |
| Torso Retention | | The dummy's torso is wholly restrained by the harness during the test | The dummy's torso is only partially restrained by the harness during the test (only one shoulder restrained) | The dummy's torso is substantially unrestrained by the harness during the test (both shoulders unrestrained) | 1 |
| Forward Head Excursion | | Sliding scale: 4 points \leq 450 from CR point; 0 point \geq 550mm from CR point 0 point if the dummy's head contacts any part of the test rig | | | 2 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q1 dummy: 4 points \leq 67; 0 point \geq 82. Q3 dummy: 4 points \leq 87; 0 point \geq 100 | | | 2 |
| Neck | +Fz; Upper neck tension (kN) | Sliding scale: Q1 dummies: 4 points \leq 0.9; 0 point \geq 1.2. Q3 dummies: 4 points \leq 1.3; 0 point \geq 1.7 | | | 1 |

| | | | |
|----------------------|-------------------------------------|--|-----------|
| | +My; Upper neck flexion moment (Nm) | Sliding scale: Q1 dummies: 4 points \leq 21 ; 0 point \geq 27. Q3 dummies: 4 points \leq 31 ; 0 point \geq 40 | 1 |
| Chest | Resultant 3ms acceleration (g) | Sliding scale: Q1 and Q3 dummies: 4 points \leq 41; 0 point \geq 55 | 1 |
| | Deflection (mm) | Sliding scale: Q1 dummy: 4 points \leq 42; 0 point \geq 53mm. Q3 dummy: 4 points \leq 38; 0 point \geq 48mm | 1 |
| Maximum score | | | 44 |

b. Side impact

A1 & A2 |

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|--------------------------|---------------------------------|---|--|--|---------------------|
| | | 4 | 1 | 0 | |
| Head Containment | | The dummy's head remains wholly below the perimeter before the test and does not strike the door during the <i>impact phase</i> of the test | | Any part of the dummy's head is above the perimeter before the test or strikes the door during the <i>impact phase</i> of the test | 2 |
| Torso Retention - | | The dummy's torso is wholly restrained by the harness during the test | The dummy's torso is only partially restrained by the harness during the test (only one shoulder restrained) | The dummy's torso is substantially unrestrained by the harness during the test (both shoulders unrestrained) | 1 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q3 dummy: 4 points \leq 60; 0 point \geq 80 | | | 2 |
| Neck | Upper neck resultant force (kN) | Sliding scale: Q3 dummy: 4 points \leq 1.3; 0 point \geq 2.4 | | | 1 |
| Chest | Resultant 3ms acceleration (g) | Sliding scale: Q3 dummy: 4 points \leq 41; 0 point \geq 67 | | | 1 |
| Maximum score | | | | | 28 |

8. Scoring for Forward Facing Child Restraint System - Type E

A1 & A2 |

a. Frontal impact

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|--------------------------------------|-------------------------------------|--|--|--|---------------------|
| | | 4 | 1 | 0 | |
| Seat Belt Sash Strap Location | | The seat belt does not contact the neck | | The seat belt contacts the neck | 1 |
| Submarining | | The dummy does not <i>Submarine</i> | | The dummy <i>Submarines</i> | 1 |
| Torso Retention – | | The dummy's torso remains wholly restrained by the seat belt sash strap during the <i>impact phase</i> of the test | The seat belt sash strap moves off the shoulder onto the upper arm during the <i>impact phase</i> of the test. | The dummy's torso comes free of the seat belt sash strap during the <i>impact phase</i> of the test. | 1 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q6 dummy: 4 points ≤ 60; 0 point ≥ 80 | | | 2 |
| Neck | +Fz; Upper neck tension (kN) | Sliding scale: Q6 dummies: 4 points ≤ 1.7; 0 point ≥ 2.3 | | | 1 |
| | +My; Upper neck flexion moment (Nm) | Sliding scale: Q6 dummies: 4 points ≤ 47; 0 point ≥ 60 | | | 1 |
| Chest | Resultant 3ms acceleration (g) | Sliding scale: Q6 dummy: 4 points ≤ 41; 0 point ≥ 55 | | | 1 |
| | Deflection (mm) | Sliding scale: Q6 dummy: 4 points ≤ 35; 0 point ≥ 44 | | | 1 |
| Maximum score | | | | | 36 |

b. Side impact

A1 & A2 |

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|-------------------------|--|---|---|--|---------------------|
| | | 4 | 1 | 0 | |
| Head Containment | | The dummy's head remains wholly below the perimeter before the test and does not strike the door during the <i>impact phase</i> of the test | | Any part of the dummy's head is above the perimeter before the test or strikes the door during the <i>impact phase</i> of the test | 2 |
| Torso Retention | | The dummy's torso remains wholly restrained by the seat belt sash strap during the <i>impact phase</i> of the test | The seat belt sash strap moves off the shoulder onto the upper arm, during the <i>impact phase</i> of the test. | The dummy's torso comes free of the seat belt sash strap during the <i>impact phase</i> of the test | 1 |

| | | | |
|----------------------|---------------------------------|---|-----------|
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q6 dummy: 4 points \leq 60; 0 point \geq 80 | 2 |
| Neck | Upper neck resultant force (kN) | Sliding scale: Q6 dummy: 4 points \leq 1.3; 0 point \geq 2.4 | 1 |
| Chest | Resultant 3ms acceleration (g) | Sliding scale: Q6 dummy: 4 points \leq 41; 0 point \geq 67 | 1 |
| Maximum score | | | 28 |

9. Scoring for Forward Facing Child Restraint System - Type F

a. Frontal impact

A1 & A2 |

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|--------------------------------------|-------------------------------------|--|---|--|---------------------|
| | | 4 | 1 | 0 | |
| Seat Belt Sash Strap Location | | The seat belt does not contact the neck | | The seat belt contacts the neck | 1 |
| Submarining | | The dummy does not <i>Submarine</i> | | The dummy <i>Submarines</i> | 1 |
| Torso Retention | | The dummy's torso remains wholly restrained by the seat belt sash strap during the <i>impact phase</i> of the test | The seat belt sash strap moves off the shoulder onto the upper arm, during the <i>impact phase</i> of the test. | The dummy's torso comes free of the seat belt sash strap during the <i>impact phase</i> of the test. | 1 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q10 dummy: 4 points \leq 60; 0 point \geq 80 | | | 2 |
| Neck | +Fz; Upper neck tension (kN) | Sliding scale: Q10 dummies: 4 points \leq 1.7; 0 point \geq 2.62 | | | 1 |
| | +My; Upper neck flexion moment (Nm) | Sliding scale: Q10 dummy: 4 points \leq 47; 0 point $>$ 60 | | | 1 |
| Chest | Resultant 3ms acceleration (g) | Sliding scale: Q10 dummy: 4 points \leq 41; 0 point \geq 55 | | | 1 |
| | Deflection (mm) | Sliding scale: Q10 dummy : 4 points \leq 35; 0 point \geq 44 | | | 1 |
| Maximum score | | | | | 36 |

b. Side impact

A1 & A2 |

| Performance Aspect (PA) | Ranking of Compliance with Performance Aspect | PA |
|-------------------------|---|----|
|-------------------------|---|----|

| | | 4 | 1 | 0 | Weighting Factor |
|--------------------------|---------------------------------|---|---|--|------------------|
| Head Containment | | The dummy's head remains wholly below the perimeter before the test and does not strike the door during the <i>impact phase</i> of the test | | Any part of the dummy's head is above the perimeter before the test or strikes the door during the <i>impact phase</i> of the test | 2 |
| Torso Retention | | The dummy's torso remains wholly restrained by the seat belt sash strap during the <i>impact phase</i> of the test | The seat belt sash strap moves off the shoulder onto the upper arm, during the <i>impact phase</i> of the test. | The dummy's torso comes free of the seat belt sash strap during the <i>impact phase</i> of the test | 1 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q10 dummy: 4 points ≤ 60; 0 point ≥ 80 | | | 2 |
| Neck | Upper neck resultant force (kN) | Sliding scale: Q10 dummy: 4 points ≤ 1.3; 0 point ≥ 2.2 | | | 1 |
| Chest | Resultant 3ms acceleration (g) | Sliding scale: Q10 dummy: 4 points ≤ 41; 0 point ≥ 67 | | | 1 |
| CRS overall score | | | | | 28 |

10. Scoring for Forward Facing Child Restraint Systems - Type G

a. Frontal impact

A1 & A2 |

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|-------------------------------|--------------------------------|--|--|--|---------------------|
| | | 4 | 1 | 0 | |
| Head Containment | | The dummy's head remains wholly below the perimeter of that part of the CRS surrounding it at the completion of the <i>post-impact phase</i> . | | Any part of the dummy's head is exposed above the perimeter of that part of the of the CRS surrounding it, at the completion of the <i>post-impact phase</i> . | 2 |
| Torso Retention | | The dummy's torso is wholly restrained by the harness during the test | The dummy's torso is only partially restrained by the harness during the test (only one shoulder restrained) | The dummy's torso is substantially unrestrained by the harness during the test (both shoulders unrestrained) | 1 |
| Forward Head Excursion | | Sliding scale: 4 points ≤ 450 from CR point; 0 point ≥ 550mm from CR point 0 point if the dummy's head contacts any part of the test rig | | | 2 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q1 dummy: 4 points ≤ 67; 0 point ≥ 82. Q6 dummy: 4 points ≤ 60; 0 point ≥ 80 | | | 2 |
| Neck | +Fz; Upper neck tension (kN) | Sliding scale: Q1 dummies: 4 points ≤ 0.9; 0 point ≥ 1.2. Q6 dummies: 4 points ≤ 1.7; 0 point ≥ 2.3 | | | 1 |

| | | | |
|----------------------|-------------------------------------|---|-----------|
| | +My; Upper neck flexion moment (Nm) | Sliding scale: Q1 dummies: 4 points ≤ 21 ; 0 point ≥ 27 . Q6 dummies: 4 points ≤ 47 ; 0 point ≥ 60 | 1 |
| Chest | Resultant 3ms acceleration (g) | Sliding scale: Q1 and Q6 dummies: 4 points <41 ; 0 point ≥ 55 | 1 |
| | Deflection (mm) | Sliding scale: Q1 dummy: 4 points ≤ 42 ; 0 point ≥ 53 mm. Q6 dummy: 4 points ≤ 35 ; 0 point ≥ 44 | 1 |
| Maximum score | | | 44 |

b. Side impact

A1 & A2 |

| Performance Aspect (PA) | | Ranking of Compliance with Performance Aspect | | | PA Weighting Factor |
|-------------------------|---------------------------------|---|--|--|---------------------|
| | | 4 | 1 | 0 | |
| Head Containment | | The dummy's head remains wholly below the perimeter before the test and does not strike the door during the <i>impact phase</i> of the test | | Any part of the dummy's head is above the perimeter before the test or strikes the door during the <i>impact phase</i> of the test | 2 |
| Torso Retention - | | The dummy's torso is wholly restrained by the harness during the test | The dummy's torso is only partially restrained by the harness during the test (only one shoulder restrained) | The dummy's torso is substantially unrestrained by the harness during the test (both shoulders unrestrained) | 1 |
| Head | Resultant 3ms acceleration (g) | Sliding scale: Q6 dummy: 4 points ≤ 60 ; 0 point ≥ 80 | | | 2 |
| Neck | Upper neck resultant force (kN) | Sliding scale: Q6 dummy: 4 points ≤ 1.3 ; 0 point ≥ 2.4 | | | 1 |
| Chest | Resultant 3ms acceleration (g) | Sliding scale: Q6 dummy: 4 points ≤ 41 ; 0 point ≥ 67 | | | 1 |
| Maximum score | | | | | 28 |

11. Star Ratings

Star ratings and their corresponding numerical ratings will be determined according to the table and the rules below.

| Overall Score | Star Rating | Numerical Star Rating |
|--------------------------------|-------------|-----------------------------|
| $X \geq 87.5\%$ | 5 | Max score 5.0 |
| $X \geq 75\%$ but $X < 87.5\%$ | 4 | $4 + ((X - 75\%) * 0.08)$ |
| $X \geq 62.5\%$ but $X < 75\%$ | 3 | $3 + ((X - 62.5\%) * 0.08)$ |
| $X \geq 50\%$ but $X < 62.5\%$ | 2 | $2 + ((X - 50\%) * 0.08)$ |
| $X < 50\%$ | 1 | $2 + ((X - 50\%) * 0.02)$ |

Where:

X = total % score

- An overall score of less than 50% will be awarded one-star rating and the numerical star rating is limited to maximum of 1.9 stars.
- The numerical star rating is to be presented in one decimal place but cannot change the star rating (i.e will be rounded down to not increase the star rating). As an example: A numerical star rating of 3.96 will be rounded down to 3.9 and awarded a dedicated 3-star rating.