Review of Seatbelt Anchorage and Dimensions of Test Bench Seat Cushion

JASIC
Motivation and Purpose

- There is no definition about whether seatbelt anchorage should be fixed or not.

- We tested the same test conditions except for that the ISOFIX anchorage is fixed or movable, and the Injury measures of a dummy were compared.
  - From those results, we reviewed that the seatbelt anchorage should be fixed or movable.
Side Impact Test Methods

- We used acceleration type sled test system
- We used Q3 dummy
- We tested 2 kinds of ISOFIX type CRS
CRS

CRS-A

CRS-B
The door velocities were in Corridor.

The relative velocities when ISOFIX anchorage fixed were out of corridor after 50ms, but it was the time after the maximum dummy injury measures. So we think it was not influenced to the comparisons.
Test Video of CRS-A

Movable ISOFIX anchorage

Fixed ISOFIX anchorage
Dummy Accelerations (CRS-A)

- **Head Acceleration**
- **Chest Acceleration**
- **Pelvis Acceleration**

**Graphs:**
- Graphs show acceleration [m/s²] over time [ms] for head, chest, and pelvis.
- Red line represents Movable ISOFIX anchorage.
- Green line represents Fixed ISOFIX anchorage.

**Graphs Description:**
- Head Acceleration graph reaches maximum acceleration of ~1200 m/s².
- Chest Acceleration graph peaks at ~900 m/s².
- Pelvis Acceleration graph shows maximum acceleration of ~1600 m/s².

**Laboratory:**
- National Traffic Safety and Environment Laboratory
Test Video of CRS-B

Movable ISOFIX anchorage  Fixed ISOFIX anchorage
Dummy Accelerations (CRS-B)

Head Acceleration

Chest Acceleration

Pelvis Acceleration

Movable ISOFIX anchorage

Fixed ISOFIX anchorage
# Maximum Dummy Injury Measures

<table>
<thead>
<tr>
<th>Region</th>
<th>Injury measure</th>
<th>Unit</th>
<th>Threshold</th>
<th>CRS-A</th>
<th>CRS-B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>ISOFIX Anchorage</td>
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<td></td>
<td></td>
<td></td>
<td>Movable</td>
<td>Fixed</td>
<td>Movable</td>
</tr>
</tbody>
</table>

|       | Head                | HPC15 | 800 | 523 | 533 | 697 | 713 |
|       | 3ms Acceleration    | G     | 80  | 81.5| 82.6| 90.9| 89.2|
|       | Chest               | Chest deflection | mm | 18.9 | 16.1 | 21.4 | 21.2 |
|       | 3ms Acceleration    | G     | —   | 47.1 | 47.9 | 60.8 | 57.5 |
|       | Pelvis              | 3ms Acceleration | G  | 83.5 | 89.5 | 108.2 | 104.9 |
# Photos of CRS Before / After Test (CRS-A)

<table>
<thead>
<tr>
<th></th>
<th>Movable ISOFIX anchorage</th>
<th>Fixed ISOFIX anchorage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before</strong></td>
<td><img src="image1" alt="Before Movable ISOFIX" /></td>
<td><img src="image2" alt="Before Fixed ISOFIX" /></td>
</tr>
<tr>
<td><strong>After</strong></td>
<td><img src="image3" alt="After Movable ISOFIX" /></td>
<td><img src="image4" alt="After Fixed ISOFIX" /></td>
</tr>
</tbody>
</table>
### Photos of CRS Before / After Test (CRS-B)

<table>
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# Photos of ISOFIX Connector after Tests

<table>
<thead>
<tr>
<th>CRS</th>
<th>Fixed ISOFIX anchorage</th>
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</thead>
<tbody>
<tr>
<td>CRS-A</td>
<td><img src="image1" alt="Photos of ISOFIX Connector after Tests" /></td>
</tr>
<tr>
<td>CRS-B</td>
<td><img src="image2" alt="Photos of ISOFIX Connector after Tests" /></td>
</tr>
</tbody>
</table>
Photos of ISOFIX Connector after Tests

Fixed ISOFIX anchorage (CRS-A)

ISOFIX connector was broken.
Conclusion about ISOFIX Anchorage

• Injury measures under conditions that the ISOFIX anchorage was fixed and movable were almost similar.
• There were cases that ISOFIX connector lever could not be moved when ISOFIX anchorages were fixed, so we could not release the ISOFIX connector and it took a long time to remove a CRS from the test bench seat.
  – It was easy to remove a CRS from the ISOFIX anchorage when the ISOFIX anchorages were movable.

We think it is better that the ISOFIX anchorage is movable.
Side Impact Test Methods

- We used acceleration type sled test system
- We used Q3 dummy
- We tested CRS fixed by seatbelt
Conclusion about Seatbelt Anchorage

- It was easy to remove CRS fixed by seatbelt from test bench seat.
- A movable seatbelt anchorage may make structure of the jig complex.

It is considered that a fixed seatbelt anchorage is an advantage because the difference between fixed and movable anchorages has a small effect on injury measures.
• There are cutouts in a seat defined in the new regulation.
• The difference between fixed and movable anchorages has a small effect on injury measures.
  – Injury measures are almost the same regardless of a distance when a CRS moves on a seat. There is no influence of a friction.
Dimensions of Test Bench Seat Cushion

- A seat shape has a small effect.
- We think it better that a seat shape is simple because it is easy to make the cushion, for example, like the shape defined in UN.