UN-Regulation No. 80
Comparative study between static and dynamic test procedure

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November 2017
Goal of UN Regulation No. 80:

- the occupant is correctly retained by the seat in front of him (and/or by the use of a safety belt – dynamic only).

- the seat and the seat anchorages are strong enough.

- after an impact the occupant is not seriously injured
Are these tests equivalent?
The current UN-Regulation No. 80 allows to approve large passenger vehicle seats and their anchorage according to two different test procedures.

**Appendix 1 (dynamic)**
- sled test with 50%ile Dummy (HII or HIII), 30-32km/h, 8-12g
- Test 1 (without belt)
- Test 2 (with belt)

**Appendix 5 (static)**
- defined forces applied to the backrest at two locations

\[ \text{or} \]

\[ F_1 \quad \text{or} \quad F_2 \]
**Testmatrix**

- Tests have been conducted
  - according to test procedure R80 Appendix 1 (dynamic) and Appendix 5 (static)
  - different seats
  - at different labs.
- All seats are equipped with quick clamping systems

<table>
<thead>
<tr>
<th>Seat</th>
<th>Test procedure</th>
<th>Belt</th>
<th>Test-No.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Dynamic (Appendix 1)</td>
<td>unbelted</td>
<td>R-80_17_01</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>unbelted</td>
<td>R80-1-1-01</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-point</td>
<td>R80-1-2-02</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seat only</td>
<td>R-80_17_02</td>
<td>not part of R80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seat only</td>
<td>R80-1-1-05</td>
<td>not part of R80</td>
</tr>
<tr>
<td></td>
<td>Static (Appendix 5)</td>
<td></td>
<td>R-80-d-17_01</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>179421190_002</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Dynamic (Appendix 1)</td>
<td>unbelted</td>
<td>R80-1-1-03</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>unbelted</td>
<td>R80-1-1-04</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Static (Appendix 5)</td>
<td></td>
<td>179421190_001</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Dynamic (Appendix 1)</td>
<td>unbelted</td>
<td>R-80_17_03</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Static (Appendix 5)</td>
<td></td>
<td>R-80-d-17_02</td>
<td></td>
</tr>
</tbody>
</table>
R80-1-1-01 - Seat A

- Tested according to R80 – Appendix 1, Test 1 (unbelted)
- Observations:
  - Auxiliary seat slides 600mm (but still in seat track)
  - Test seat slides without any load of the dummies completely out of the seat track
    → seat mountings are not strong enough to hold the seat in place
    → Occupants are not restrained by the test seat
  - Dummy values are below the thresholds but serious injuries are likely
Results – Dynamic Test 2

R80-1-2-02 - Seat A
- Tested according to R80 – Appendix 1, Test 2 (belted)
- Observations:
  - Auxiliary seat detaches completely from the seat track
  - Test seat slides without any load of the dummies completely out of the seat track
  → seat mountings are not strong enough to hold the seat in place
  → Occupants are not restrained by the test seat
  - Dummy values are below the thresholds but serious injuries are likely

Pre-test
Post-test - Dummies
Post-test - overview
Results – Static Test

179421190 002 – Seat A

- Tested according to R80 – Appendix 5
- Observations:
  - Seat stays in place, no failure
  - The maximum displacement at $F_1$ is below the threshold of 400mm
  - The minimum displacement at $F_1/F_2$ is above the threshold of 100/50mm
Conclusion

The statically (appendix 5) tested seats, when tested according to the dynamic test, collapsed in the dynamic tests

→ Goal of UN Regulation No. 80 is not achieved when tested statically

Proposal: delete static test according to Appendix 5
In addition it has been observed that the static test procedure:
• does not consider dynamic effects like:
  – oscillation
  – inertia
    ▪ mass and mass distribution of the seat
    ▪ detaching of accessories
    ▪ detaching/sliding/failure of clamp connection and locking
• does only partially take into account the different installation situation of the seat (lateral and vertical offset of seats, etc.).

The dynamic test procedure:
• Does not limit the sliding of the seat anchorage
Thank you for your attention!
<table>
<thead>
<tr>
<th>Seat</th>
<th>Test procedure</th>
<th>Belt</th>
<th>Test-No.</th>
<th>Resistance of seat/seat mountings</th>
<th>Occupants restraint</th>
<th>Occupant load</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Dynamic (Appendix 1)</td>
<td>unbelted</td>
<td>R-80_17_01</td>
<td>test seat slides ~240mm and detaches partly; auxiliary seat slides ~100mm*)</td>
<td>excursion below threshold</td>
<td>values above threshold</td>
</tr>
<tr>
<td></td>
<td></td>
<td>unbelted</td>
<td>R80-1-1-01</td>
<td>test seat slides out of seat track; auxiliary seat slides ~600mm</td>
<td>not restrained</td>
<td>values below threshold</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-point</td>
<td>R80-1-2-02</td>
<td>test seat slides out of seat track; auxiliary seat detaches</td>
<td>not restrained</td>
<td>values below threshold</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>Seat only</td>
<td>R-80_17_02</td>
<td>seat slides ~655mm</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seat only</td>
<td>R80-1-1-05</td>
<td>seat slides ~665mm</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Static (Appendix 5)</td>
<td>-</td>
<td>R-80-d-17_01</td>
<td>seat slides ~20mm</td>
<td>correctly restrained</td>
<td>sufficient deformation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>179421190_002</td>
<td>seat does not move</td>
<td>correctly restrained</td>
<td>sufficient deformation</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Dynamic (Appendix 1)</td>
<td>unbelted</td>
<td>R80-1-1-03</td>
<td>test seat slides ~39mm</td>
<td>Dummy excursion below threshold</td>
<td>values below threshold</td>
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<tr>
<td></td>
<td></td>
<td>unbelted</td>
<td>R80-1-1-04</td>
<td>test seat slides ~16mm</td>
<td>excursion below threshold</td>
<td>values below threshold</td>
</tr>
<tr>
<td></td>
<td>Static (Appendix 5)</td>
<td>-</td>
<td>179421190_001</td>
<td>Seat does not move</td>
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</tr>
<tr>
<td><strong>C</strong></td>
<td>Dynamic (Appendix 1)</td>
<td>unbelted</td>
<td>R-80_17_03</td>
<td>test seat slides (~340mm)</td>
<td>excursion below threshold</td>
<td>values below threshold</td>
</tr>
<tr>
<td></td>
<td>Static (Appendix 5)</td>
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</table>

*) seat sliding influenced due to tape on seat track

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Julian Ott  November 2017  Slide 12