

Investigations into the 800 mm Horizontal Plane Requirement in Regulation No. 44

Transmitted by the expert from CLEPA

39th GRSP Session

Working Party on Passive Safety

Geneva – May 15 – 19, 2006

R44 Requirement on Manikin Displacement – Para 7 1 4 4

- 7.1.4.4. Manikin displacement
- 7.1.4.4.1. Child restraints of the "universal", "restricted" and "semi-universal" categories:
- 7.1.4.4.1.1. Forward facing child restraints: the head of the manikin shall not pass beyond the planes BA and DA as defined in Figure 1 below. This shall be judged up to 300ms or the moment that the manikin has come to a definitive standstill whatever occurs first. 5/

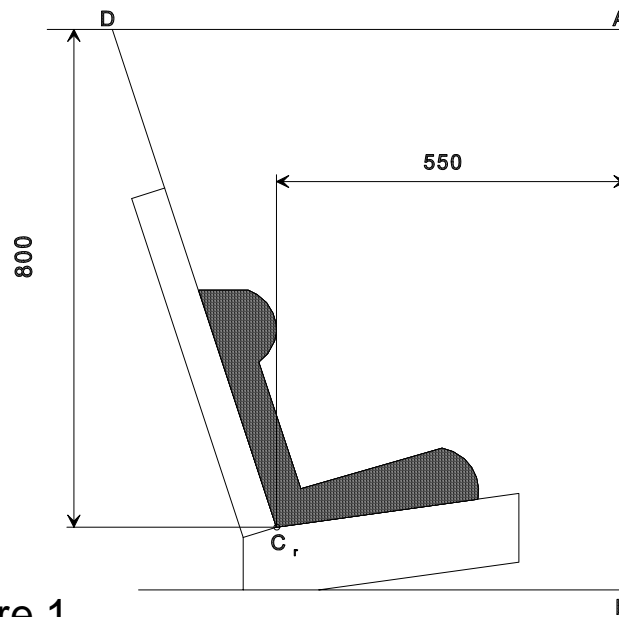


Figure 1
Arrangement for testing a forward-facing device

R44 Requirement on Manikin Displacement – Para 7 1 4 4

- 7.1.4.4.1.2. Rear-facing child restraints:

- 7.1.4.4.1.2.1

- » Child restraints supported by dashboard: the head of the manikin shall not pass beyond the planes AB, AD and DCr, as defined in Figure 2 below. This shall be judged up to 300 ms or the moment that the manikin has come to a definitive standstill whatever occurs first.

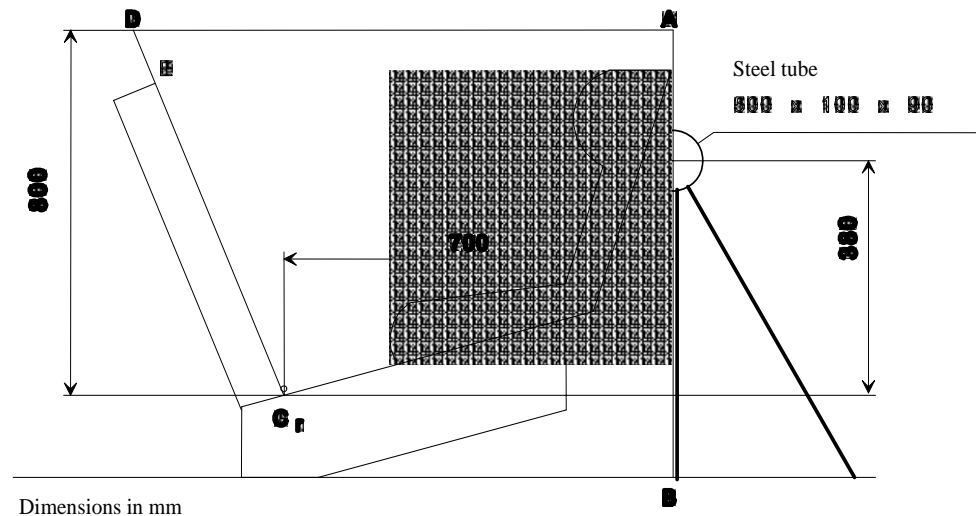


Figure 2:
Arrangement for testing
a rearward-facing device

R44 Requirement on Manikin Displacement – Para 7 1 4 4

- The 800 mm limit plane was introduced in Regulation No. 44 at the time where no specifications existed for roll over test, called also overturning.
- The background data was generated from measurements on vehicles in order to establish a zone for which a contact between the child's head and the vehicle interior can be avoided.

Issues with this requirement

1. Large Rear Facing Child Seats

80 mm



CRS is positioned in full contact with the vehicle seat back. Distance between the top of the CRS and the 800mm limit is 80mm.

55 mm

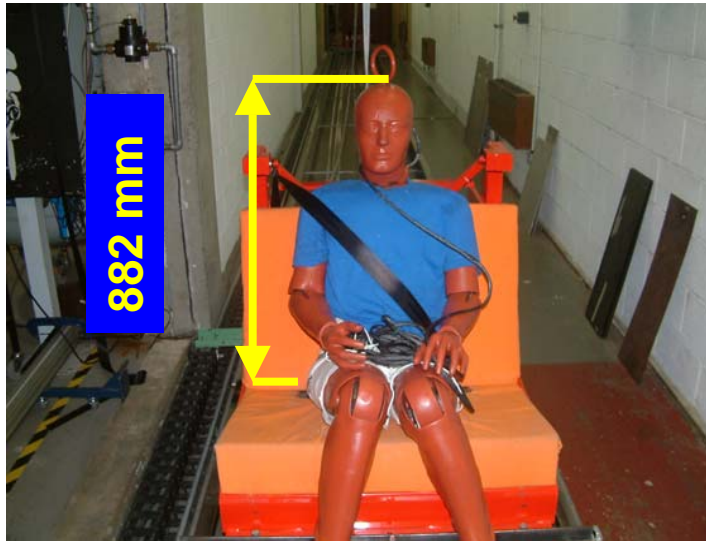


CRS is positioned 100mm forward from the vehicle seat back. Distance between the top of the CRS and the 800mm limit is 55mm.

Issue with this requirement

2. Compatibility with 50th percentile adult dummy

Measurement of the Hybrid II 50th percentile dummy head position with respect to the 800 mm plane.



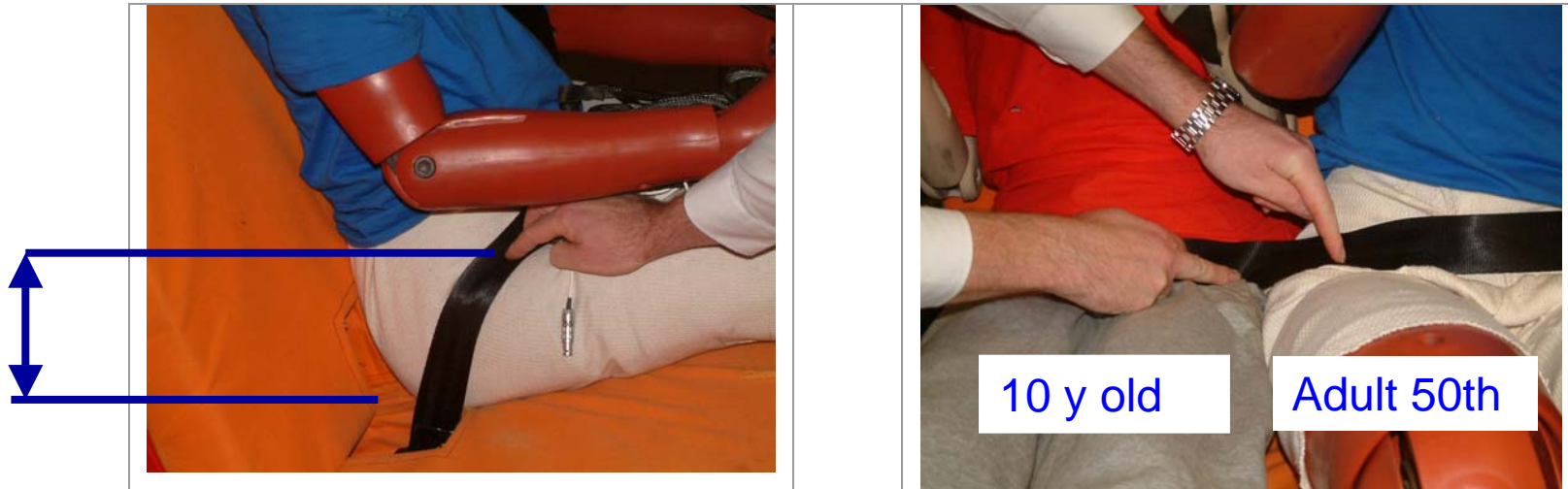
Laser point indicating the 800 mm height

- The 800 mm requirement is well below the top of the head of an average adult male.
- There is a need to adapt the 800 mm plane to occupant space available in vehicles.

Issue with this requirement

3. Booster seat design requirements

Measurement of vertical distance between belt load bearing point and Cr point of a R44 sled bench for an adult 50° dummy and a 10 year old and 3 year dummies



Vertical Pelvic position at load bearing point of Hybrid 2 - 50th from Cr - 191mm

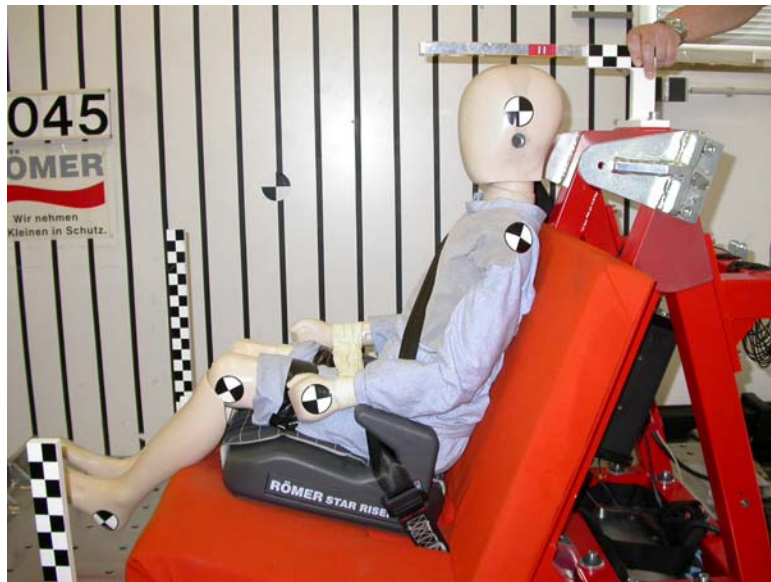
34 mm lower for P10
70 mm lower for P3

Issue with this requirement

3. Booster seat design requirements

- The objective of using a booster seat is to raise the pelvis of a child to the same position of that of an adult
- The results above show that the minimum distance needed to reach this position is 70 mm for the smallest dummy.
- For R44 group 2 and 3 type of restraints this shows also the need to raise the P10 dummy by a minimum of 70mm
- The top of the head for this dummy will reach 780 mm with respect to Cr point, i.e. **20 mm below the 800 mm plane.**
- This offers a very small margin for design options and innovations for the population covered by P10 dummy.

Illustration of the Problem



Height Top of the head 785 mm



A very small margin

Consequence

- Reduce occupant vertical position to comply with the 800 mm limit
 - Including that of the smallest , i.e. the 3 year old
 - Less space under the occupant , with a potential risk in submarining

Issue with this requirement

4. Compatibility with requirements of Overturning Test – Para 7.1.3.1.

- *7.1.3.1. The child restraint shall be tested as prescribed in paragraph 8.1.2.; the manikin shall not fall out of the device and, when the test seat is in the upside down position the manikin's head shall not move more than 300 mm from its original position in a vertical direction relative to the test seat.*
- If a P10 dummy on a booster CRS records an initial 800mm it can therefore move 300mm and shows an overall position of 1100mm and still be considered acceptable.
- This overturning requirement appears to be in contradiction with the requirement of the dynamic vertical pass/fail threshold.
- Therefore there is a need to have consistent requirements between the two aspects, the 800 mm horizontal plane and the overturning test.

CLEPA Proposal – Extending 800 mm plane to 900 mm

- Benefits
 - More space for the child's leg for the group 1 rear facing seat, which will enable an extended use of this type of seat.
 - A consistency with vehicle space available for adult occupants at or above the 50th percentile population
 - More design options for the larger child population and better belt positioning of the smaller child without compromising the safety
 - With the proposed change (+100 mm) being consistent with the requirement of paragraph 7.1.3.1. which in fact accepts +300 mm head vertical excursion.

Proposed Amendment to R44/04

- **PROPOSAL**
- Paragraph 7.1.4.4.1.1., amend to read:
 - "... Figure 1, 800 dimension to read **900**."
- Paragraph 7.1.4.4.1.2.1., amend to read:
 - "...Figure 2, 800 dimension to read **900**."
- Paragraph 7.1.4.4.1.2.2., amend to read:
 - "...Figure 3, 800 dimension to read **900**."
- Paragraph 7.1.4.4.1.2.3., amend to read:
 - "...Figure 4, 800 dimension to read **900**."

Proposed Amendment to R44/04 Para 7.1.4.4.

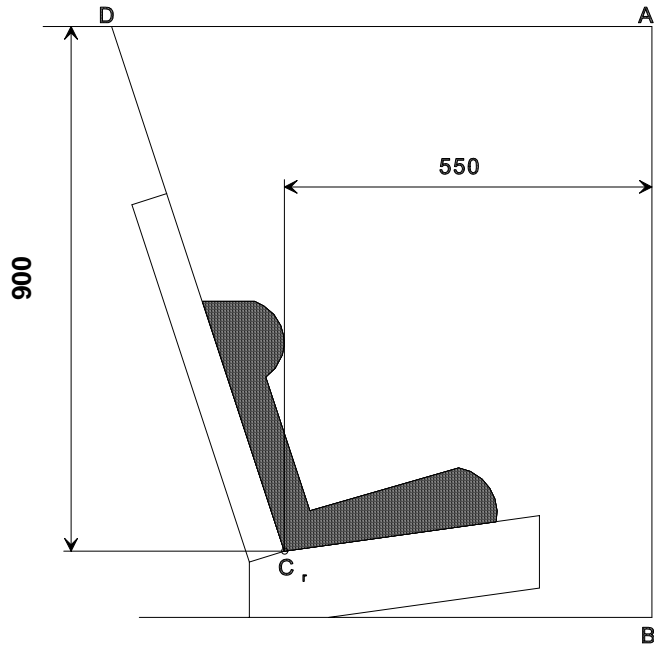


Figure 1: Arrangement for testing a forward-facing device.

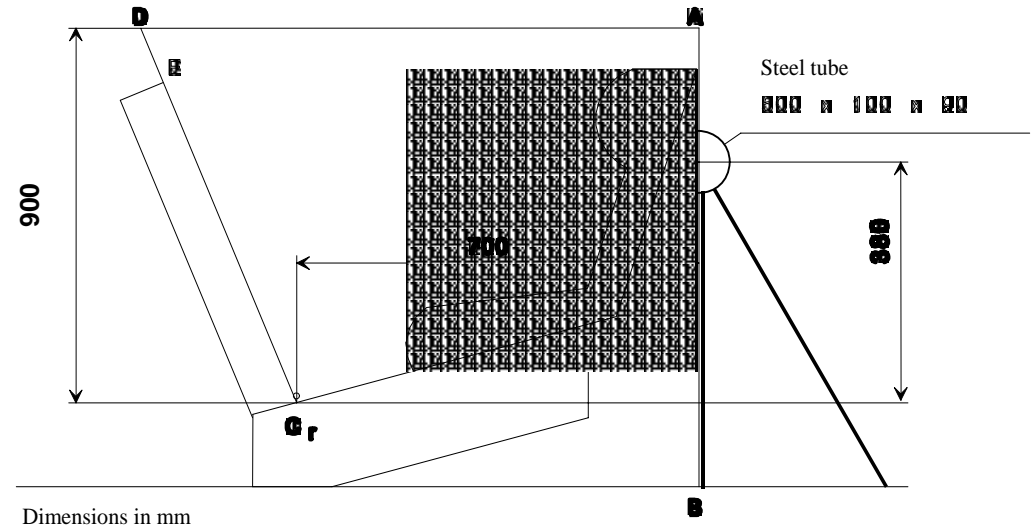


Figure 2: Arrangement for testing a rearward facing device

Proposed Amendment to R44/04 Para 7.1.4.4.

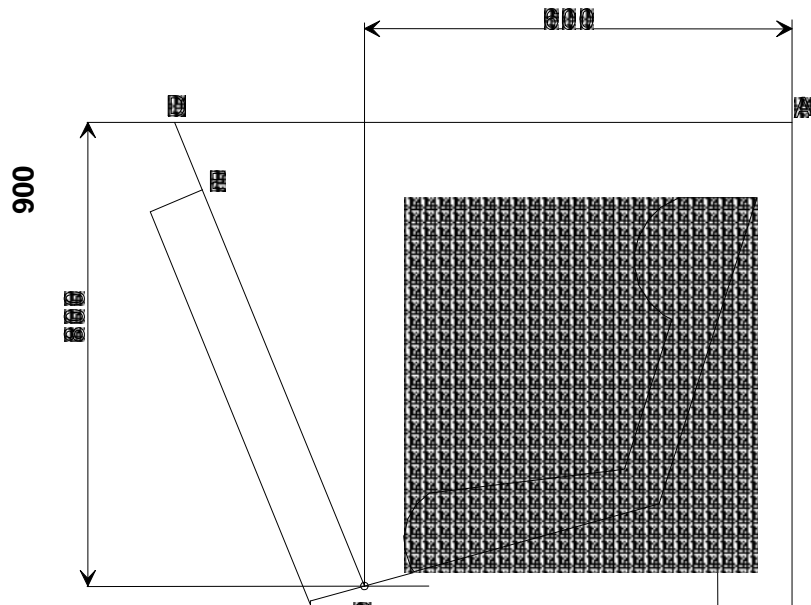


Figure 3: Arrangement for testing child restraint devices group 0, not supported by the dashboard

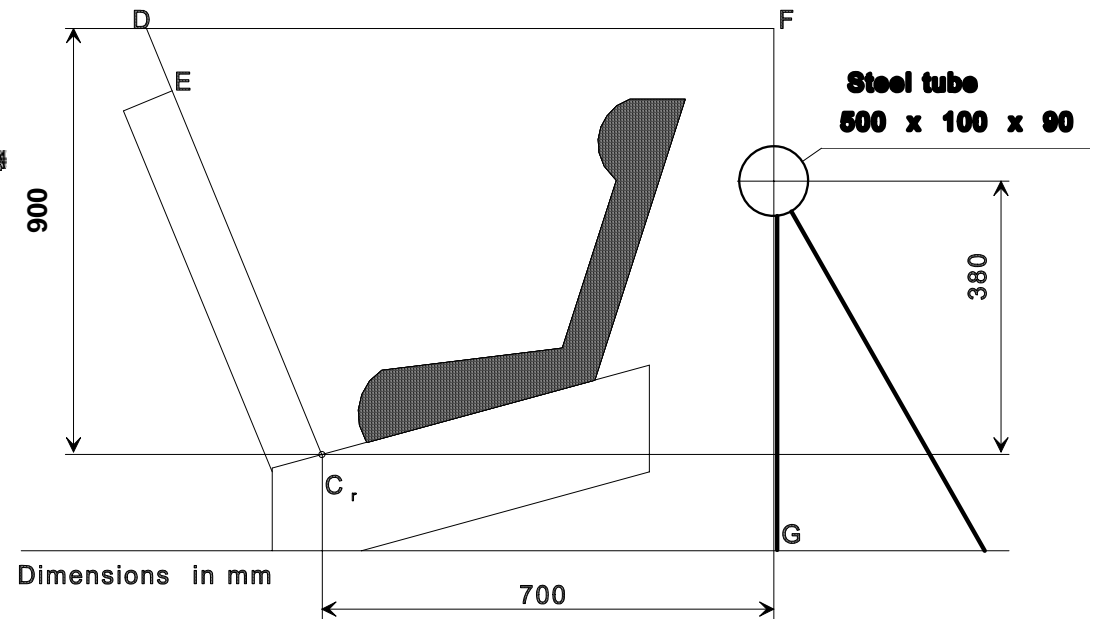


Figure 4 : Arrangement for testing rearward-facing devices, except group 0, not supported by the dashboard