Regulation 44 – Child Restraint Systems

Clepa Proposal to Review 800 mm Horizontal Plane Requirement

Para 7.1.4.4.1

Presented at the 42nd Session of the Working Party on Passive Safety
GRSP
December 10-14, 2007
Previous Discussions

  - Main motivation
    - more leg room for children in rear facing group 1 and above and better protection of the abdomen in boosters

  - "GRSP agreed to consider amending the provisions concerned. The expert from CLEPA was invited to prepare a concrete proposal and to transmit it in due time to the secretariat for distribution with an official symbol at the next GRSP session”.

- 40th session Dec 2006
  - Discussion of measurements of vehicle heights
  - No agreement on 800 mm plan increase of height

- 41th session May 2007
  - Clepa announced an updated proposal for next session
Illustration of the Problem
Plane DA in Para 7.1.4.4.1.1

The height under the 800 mm DA plane leaves a very small margin
Focussing on Booster Seat Population
Risk of injuries is higher for age 4+

Injuries to Children by Age Group: 2005

As children age, their risk of being injured in a crash rises. This is likely associated with high rates of child-restraint use for the youngest children and shows the need for age-appropriate restraint in older children. Restraints include car safety seats, booster seats, and lap/should seat belts.

3 Times Higher Risk
Abdominal Injuries In Frontal Impact – Children Restrained in Boosters European CHILD Project Data

Ref: Alan Kirk et Al. « Analysis of CHILD Data Related to Frontal Impacts ». Protection of Children in Cars, 7th – 8th December 2006.

AIS 2+ injuries – Abdomen Accounts for 1/3 of injuries
Seat Belt Syndrome – Main Mechanism

Child’s pelvic anatomy differs from the adult’s one:

Iliac Wing Height smaller and more deformable structure

*Courtesy UMTRI*
Pelvic Structure more deformable & Iliac Wing Height Smaller than that of the adult

Courtesy UMTRI
Key Role of a Booster

Proper routing of the lap belt and maintaining the belt on the thighs
Investigation into vehicle structural stiffness

Frontal Offset Tests Carried out by EuroNCAP
- 2000 up to 2006 models
From EuroNCAP Frontal Tests

B Post Simplified Deceleration Pulse vs time
Super mini vehicle

B Post Simplified Deceleration Pulse vs time

- 4 Star Supermini (2000)
- 5 Star Supermini (2005)
Family Vehicle

B Post Simplified Deceleration Pulse vs time

2\textsuperscript{nd} plateau + 53 %
MPV vehicle

B Post Simplified Deceleration Pulse vs time

2nd plateau + 35 %
Rear Seat Occupant Loads are increasing

- Same CRS
- Same vehicle model
- P3 Chest Acceleration + 35%

Need to mitigate the increase of loads on occupants with features requiring load limiting functions and space
EU Directive 2003/20/EC
Translation of 1,5 m stature

800 mm DA Plane

Directive max sitting height 779 mm
95° 10 y old or 50° 12y old

Expressed in R44 test rig geometry 731 mm

With a 100 – 120 mm thick booster, sitting height 831 to 851mm

P10 Dummy with 100 to 120 mm 781 to 801 mm
Measurement of the Hybrid II 50th percentile dummy head position with respect to the 800 mm plane.

• The 800 mm requirement is well below the top of the head of an average adult male.
Clepa Proposition

- Taking into account previous discussions at GRSP
  - we propose to withdraw previous proposal (increase of height to 900 mm)

- We propose to focus our attention on the child population the most exposed – 4 to 12 years: i.e. children using booster seat restraint

- Need to mitigate the higher loads generated in crashes by increased stiffness of present vehicles

- Space needed for booster height design is crucial: 100 to 120 mm

- Application of Directive 2003/20/EC for 1.5 m height will be challenging if not impossible to address

- Propose to remove the 800 mm requirement only for the test with the 10y old dummy

- 7.1.4.4.1.1. Amend to read “Forward facing child restraints: the head of the manikin shall not pass beyond the planes BA and DA as defined in Figure 1 below, except for booster seats when using the largest dummy P10 in relation to DA plane.”