

# Regulation 44 – Child Restraint Systems Clepa Proposal to Review 800 mm Horizontal Plane Requirement

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## 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

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- 38th session, Dec 2005 , Informal GRSP-38-9
  - Main motivation
    - more leg room for children in rear facing group 1 and above and better protection of the abdomen in boosters
- 39th session May 2006 ECE/TRANS/WP.29/GRSP/2006/9
  - “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

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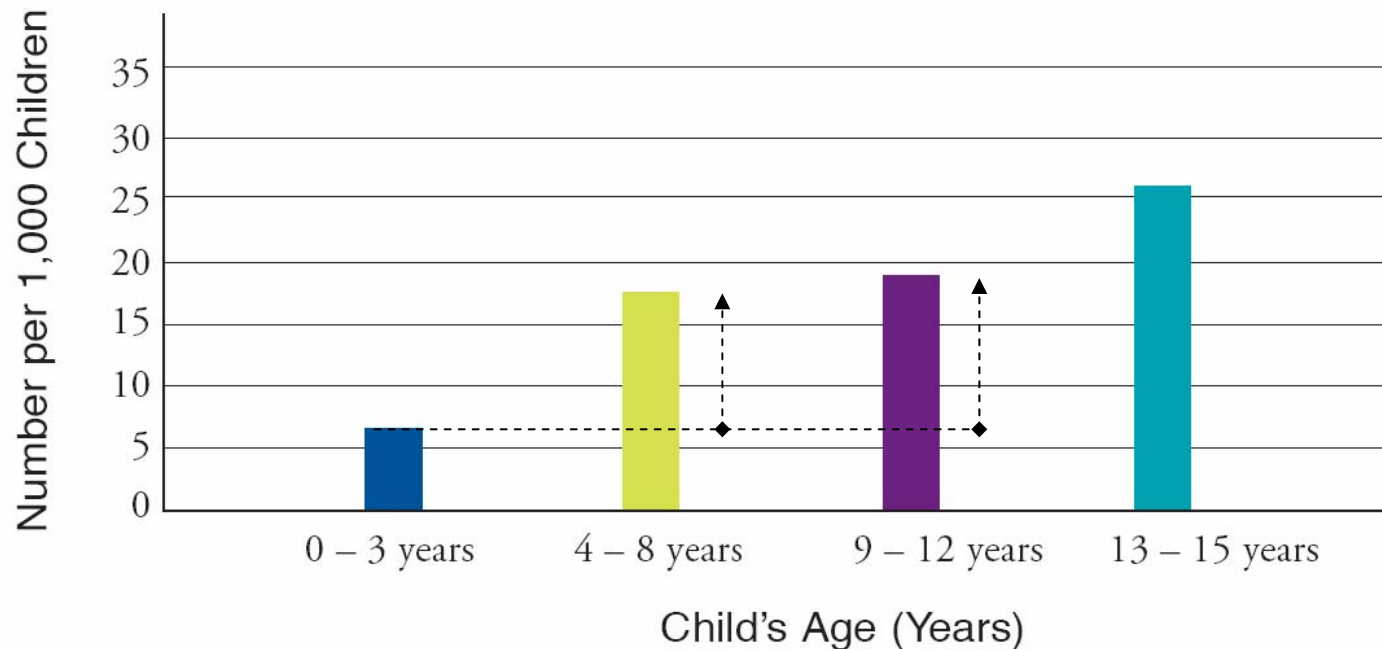


***The height under the 800 mm DA plane leaves a very small margin***

# Focussing on Booster Seat Population

## Risk of injuries is higher for age 4+

### Injuries to Children by Age Group: 2005

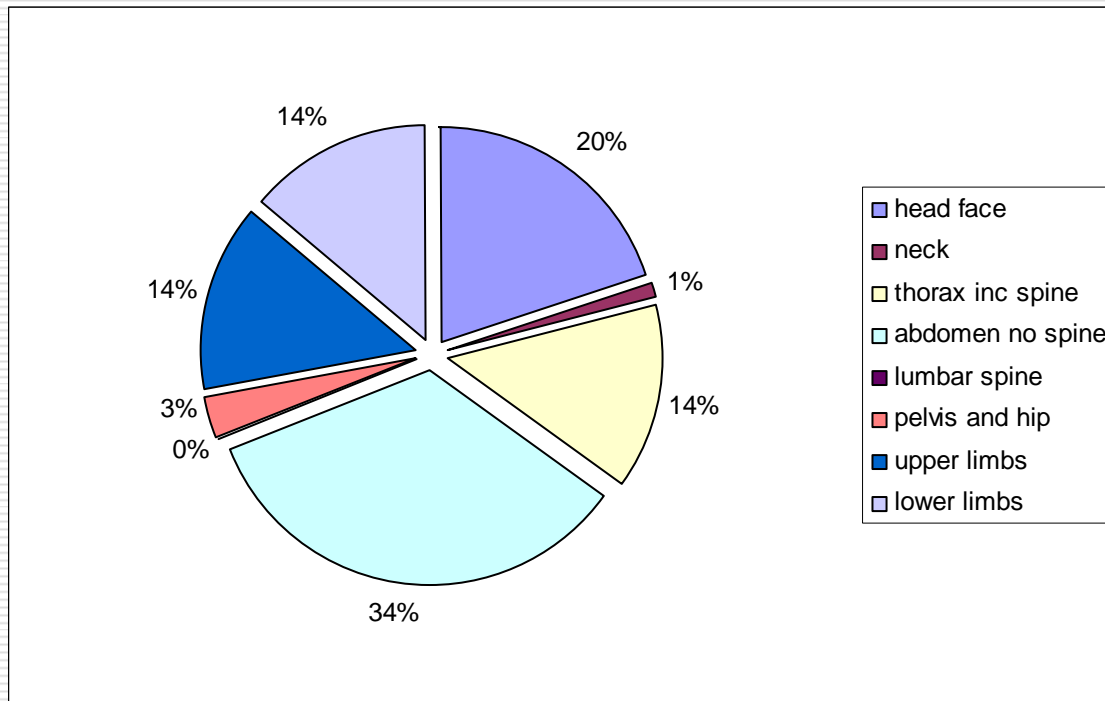


As children age, their risk of being injured in a crash rises. This is likely associated with high rates of child-restraint use for the youngest children and shows the need for age appropriate restraint in older children. Restraints include car safety seats, booster seats and lap/shoulder seat belts.

**3 Times Higher Risk**



# Abdominal Injuries In Frontal Impact – Children Restrained in Boosters European CHILD Project Data



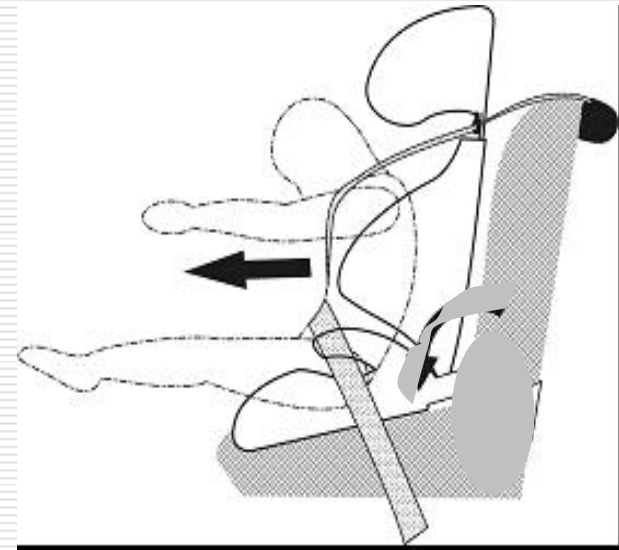
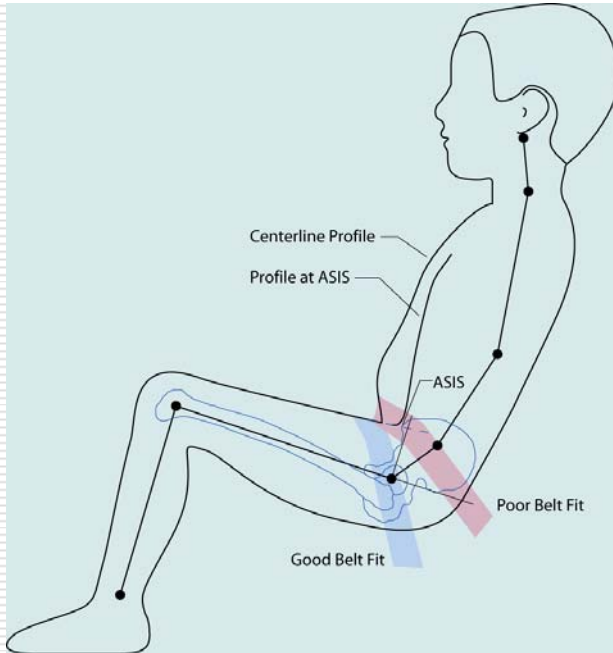
Ref: Alan Kirk et Al.  
« Analysis of CHILD  
Data Related to  
Frontal Impacts ».  
Protection of Children  
in Cars, 7th – 8th  
December 2006.



*AIS 2+ injuries – Abdomen Accounts for 1/3 of injuries*

# Seat Belt Syndrom – Main Mechanism

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*Courtesy UMTRI*

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

Iliac Wing Height smaller and more deformable structure

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

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Courtesy UMTRI

# Key Role of a Booster

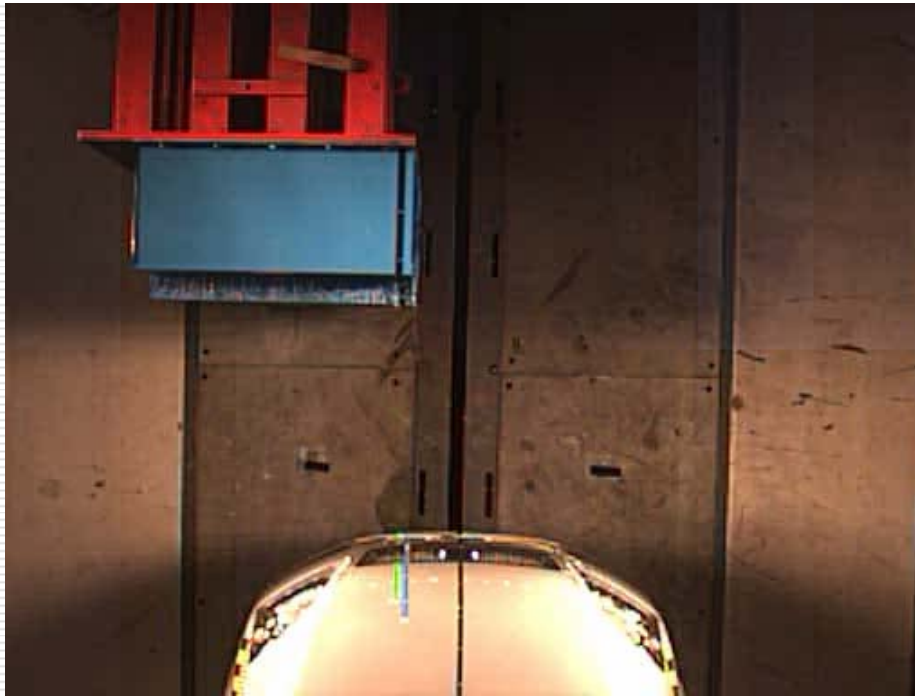
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Proper routing of the lap belt  
and maintaining the belt on  
the thighs

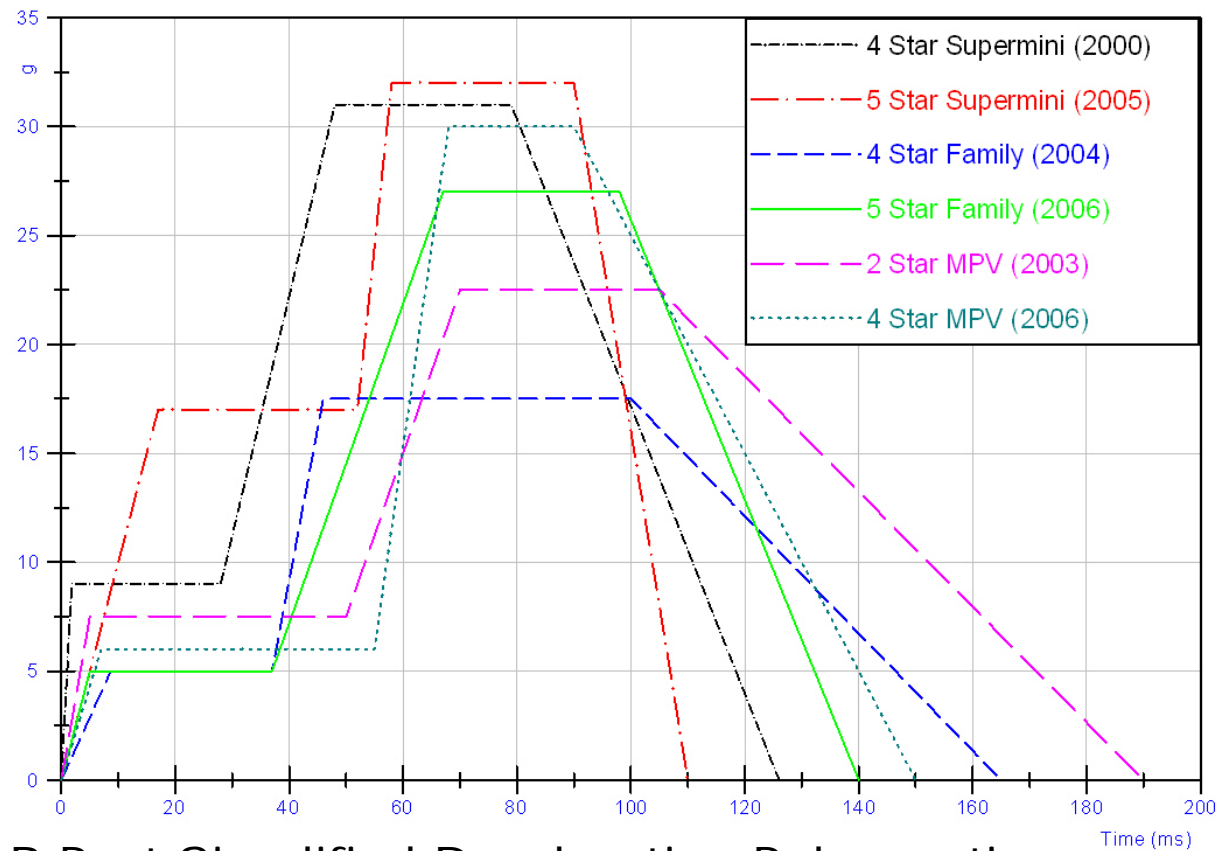
# Investigation into vehicle structural stiffness

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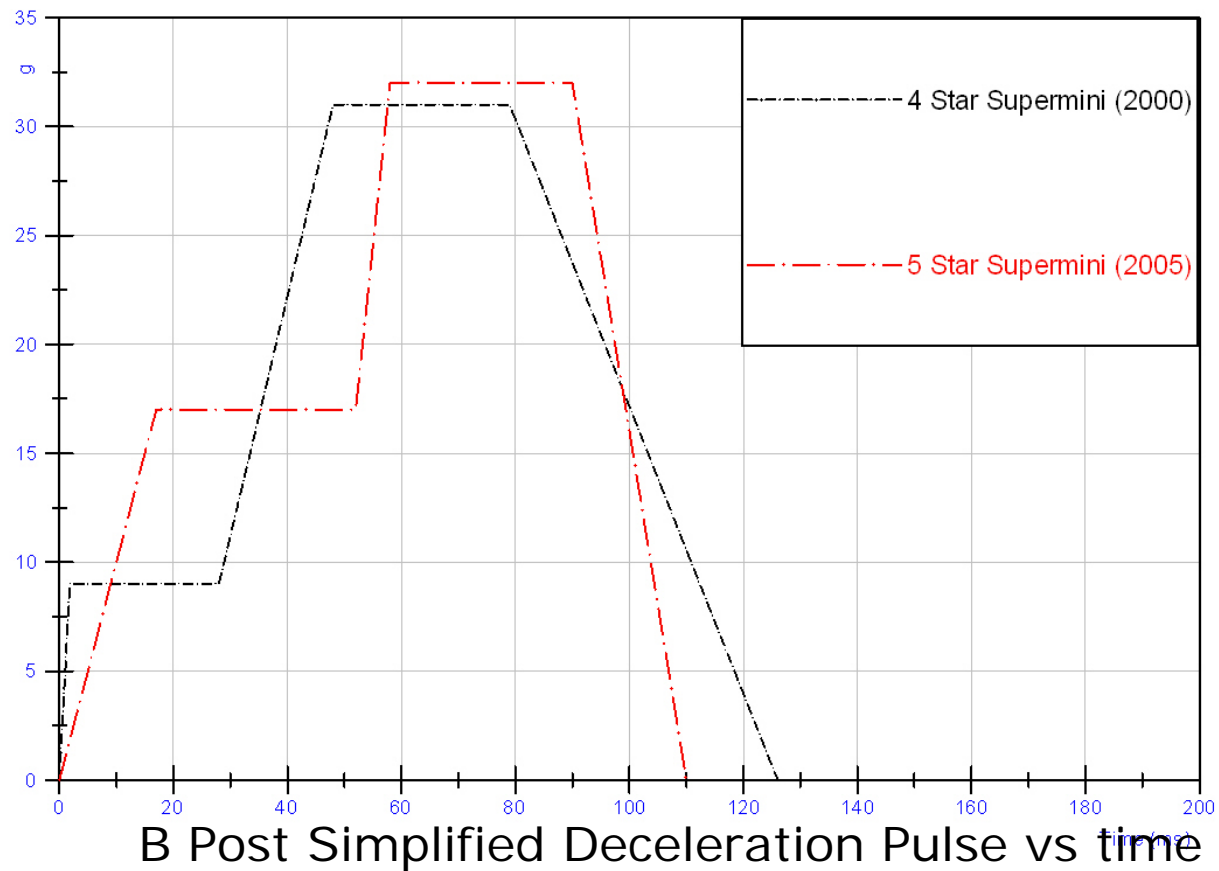
*Frontal Offset Tests Carried out by EuroNCAP*

# - 2000 up to 2006 models From EuroNCAP Frontal Tests

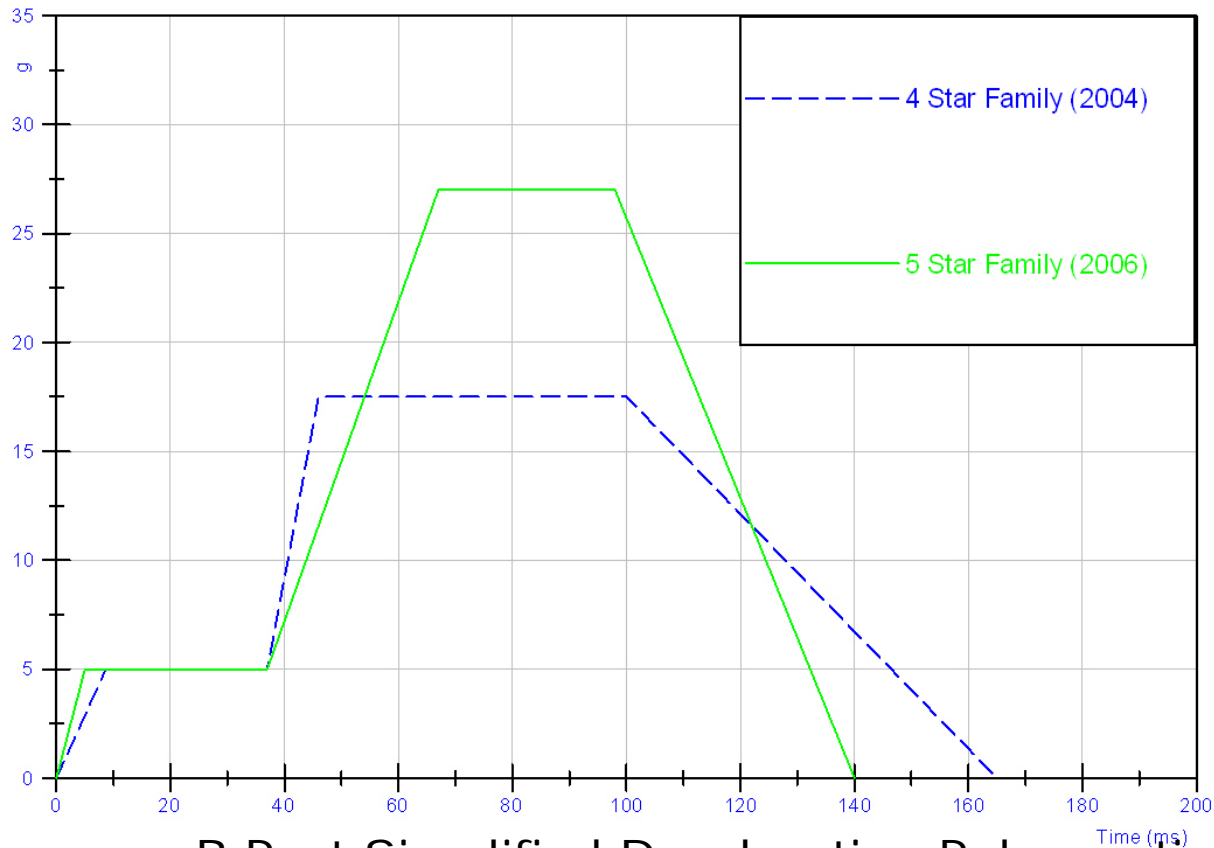


B Post Simplified Deceleration Pulse vs time

# Super mini vehicle



# Family Vehicle

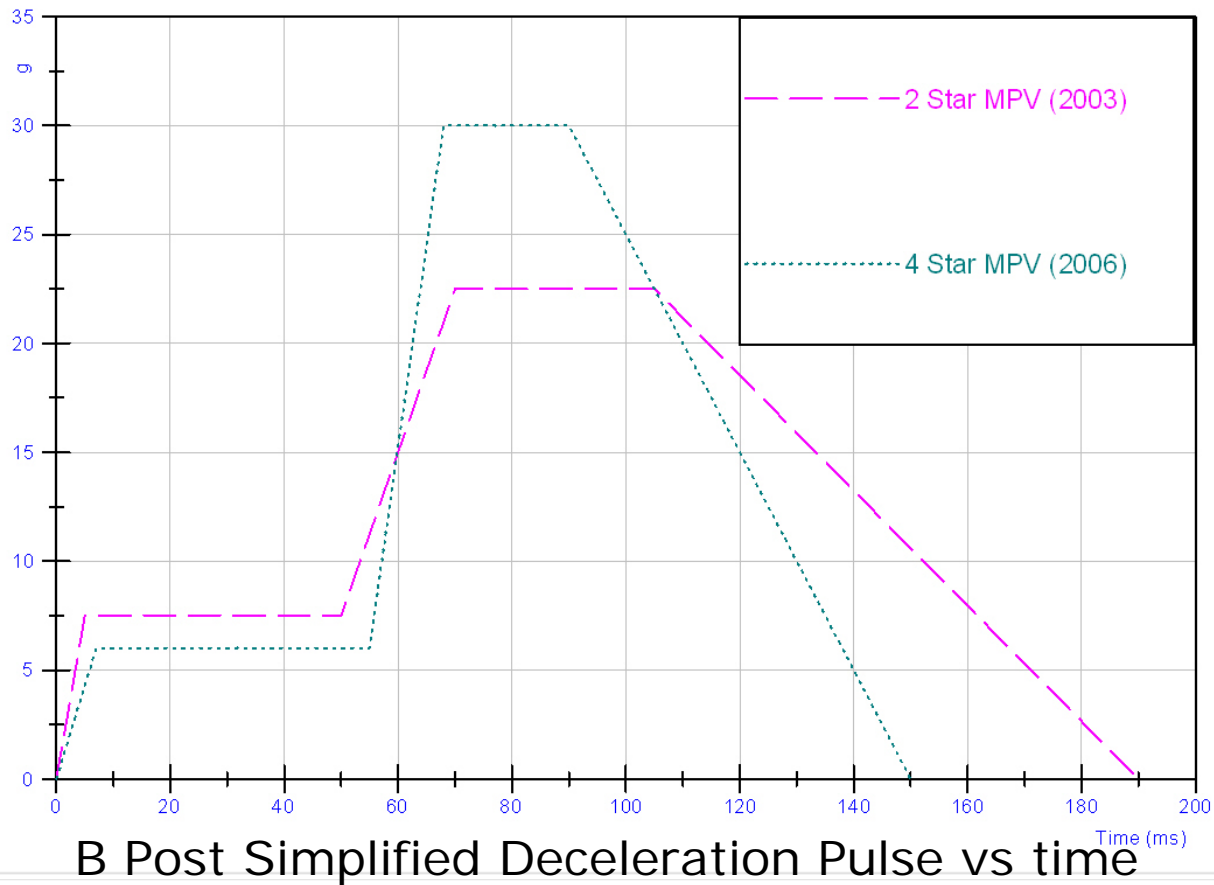


B Post Simplified Deceleration Pulse vs time

2<sup>nd</sup> plateau +  
53 %



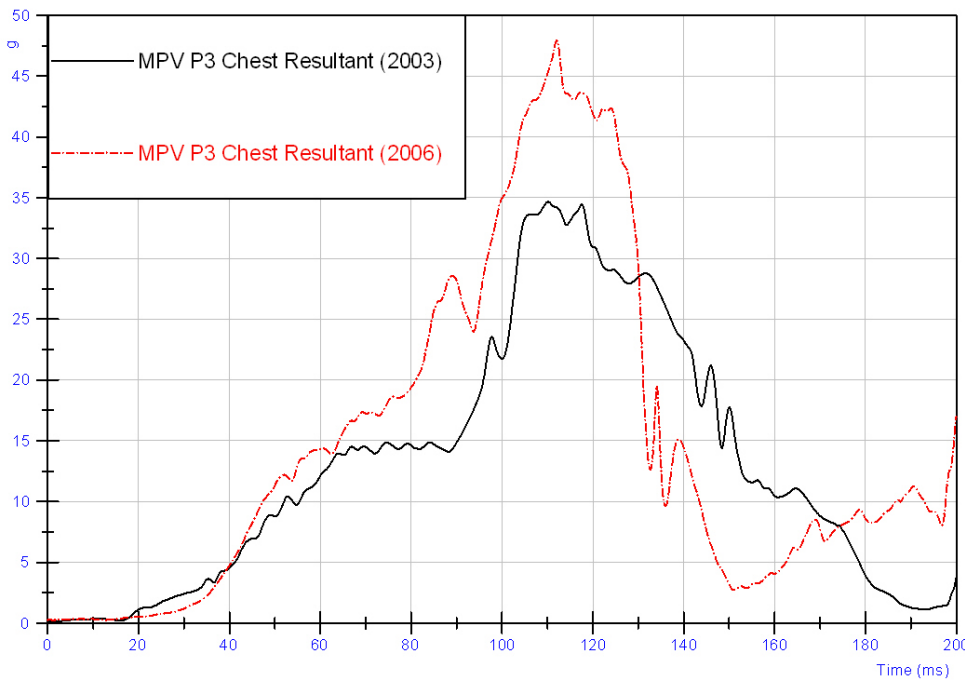
# MPV vehicle



2<sup>nd</sup> plateau +  
35 %

# Rear Seat Occupant Loads are increasing

## Resultant Chest Acceleration



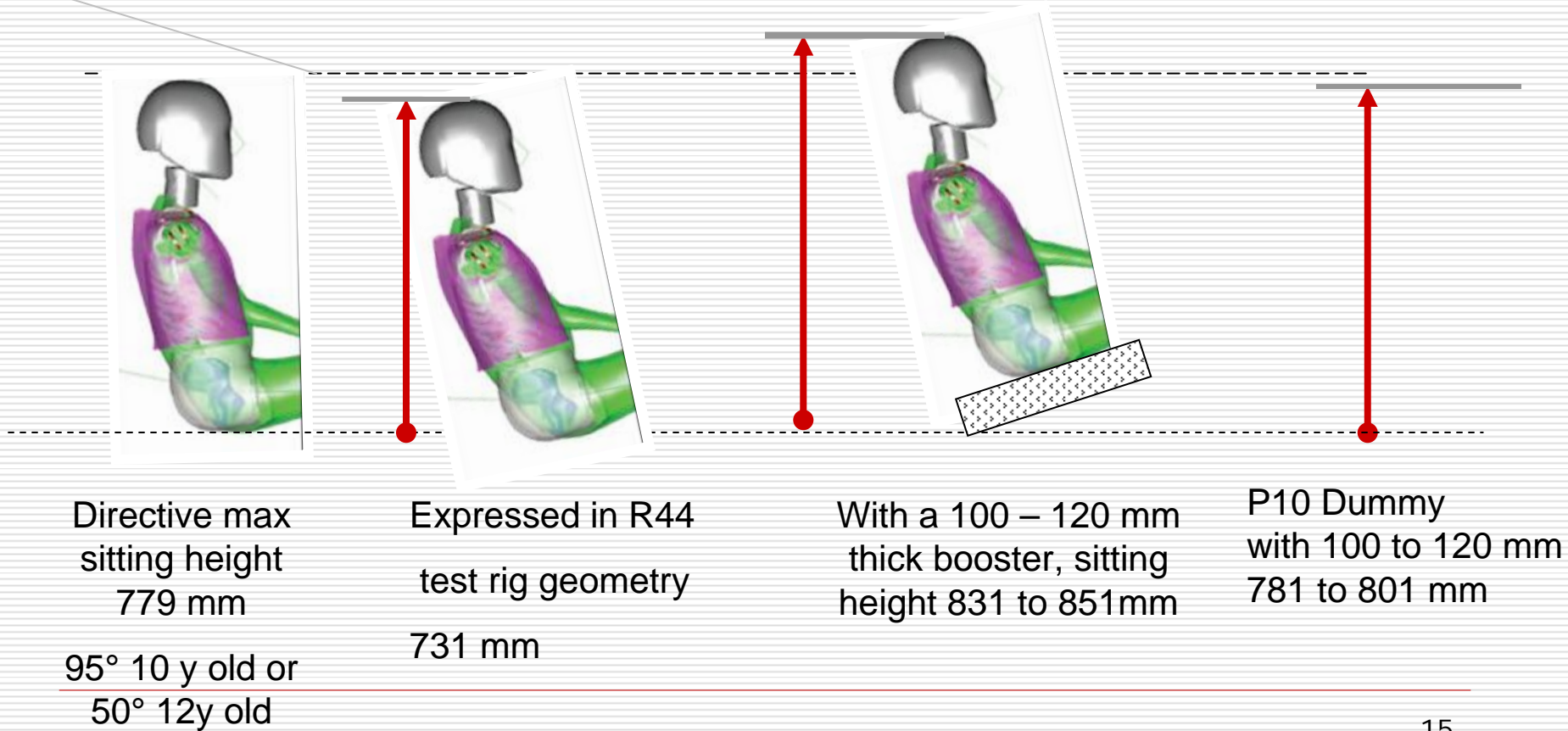
- Same CRS
- Same vehicle model
- P3 Chest Acceleration + 35%

*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



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

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Laser point indicating the 800 mm height

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

# Clepa Proposition

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- Taking into account previous discussions at GRSP
  - we propose to withdraw previous proposal (increase of height to 900 mm)
- We propose to focuss 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 boosters seats when using the largest dummy P10 in relation to DA plane.**