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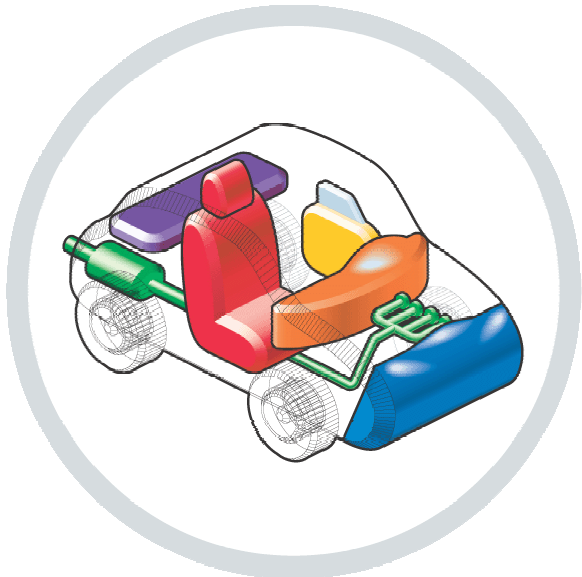
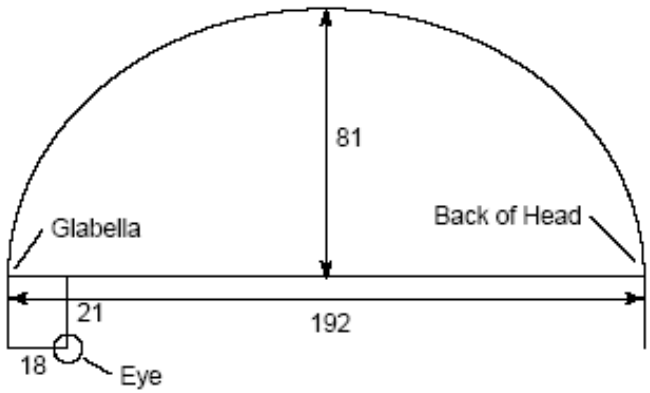
GTR HR

Head positions, summary of UMTRI study & vehicle examples

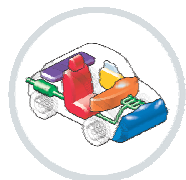


Anthropometry basis of UMTRI study

- **Mean male/female head size :**



- **Basis : ANSUR data (US 1989)**



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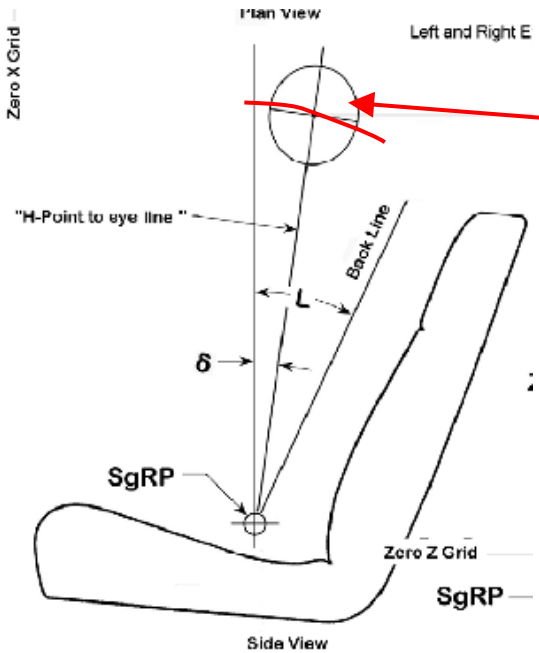
GTR HR – Head positions

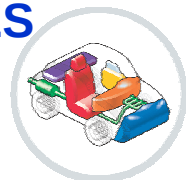
Anthropometry basis of UMTRI study

- Eye ellipses of occupants in seats with fixed seat back angle



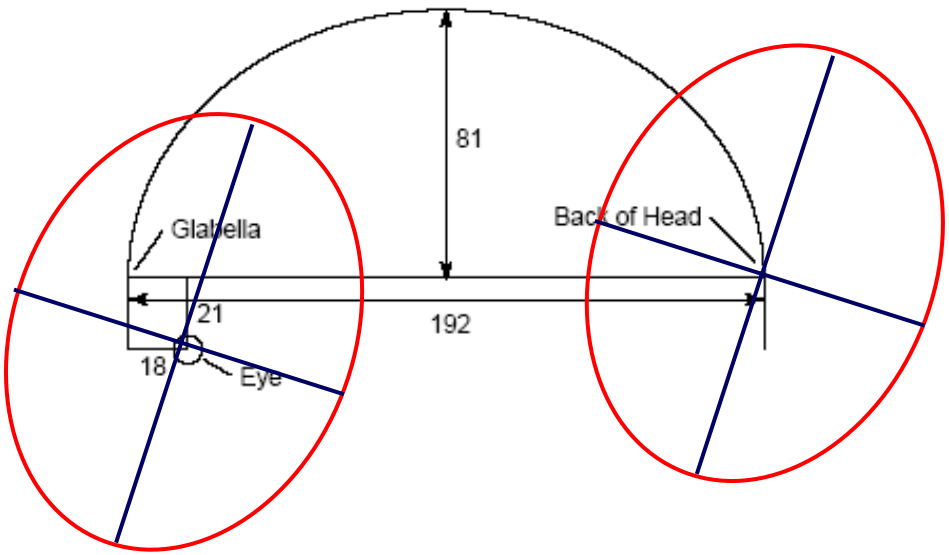
the position of the eye ellipse is varying with a change of the torso angle, but the form remains identical

- Basis : posture study (up to 120 drivers in 22 vehicles) & NHANES III (US) anthropometry
- NHANES III : male stature ($5^{th:}$ 1636, $50^{th:}$ 1755, 95^{th}: 1880mm)
  female stature ($5^{th:}$ 1504, $50^{th:}$ 1618, 95^{th}: 1730mm)



Anthropometry basis of UMTRI study

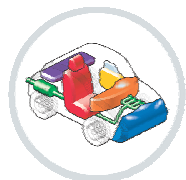
- **Combining eye ellipse & mean head size = ellipse of back of head (occiput)**



95th cut-off ellipse

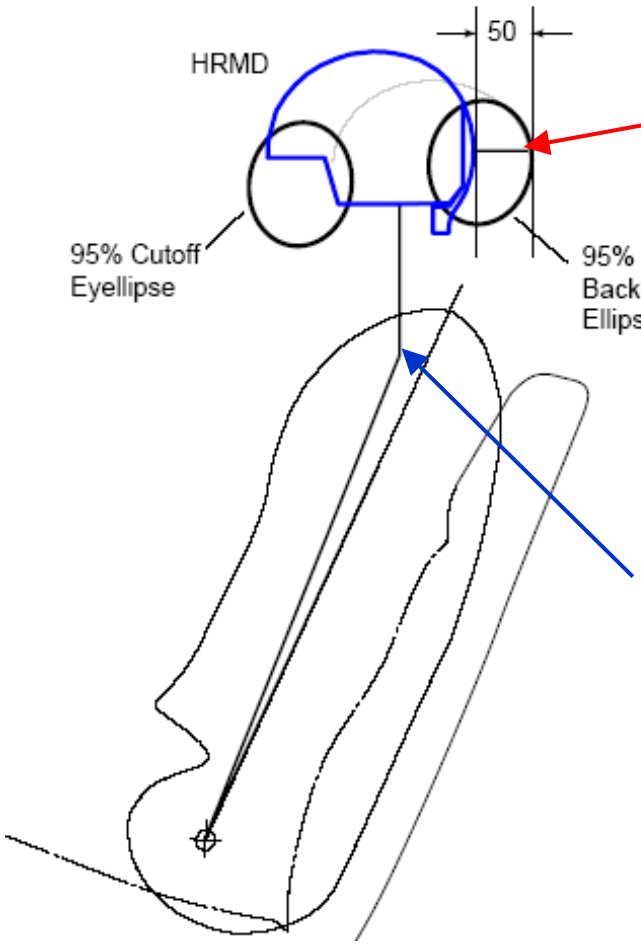
Eye ellipse is only translated and head size variations are not taken into account in UMTRI model.

According UMTRI : Standard deviation of for-after driver head position is 35.3mm & male head length is 7mm & correlation between stature & head length is 0.35



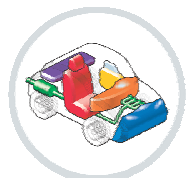
Anthropometry basis of UMTRI study

- **Superposition with HRMD at 25° fixed torso angle**



A backset of 50mm in respect to HRMD will slightly cut the back-of-head ellipse

HRMD pivot point when installed on SAE manekin



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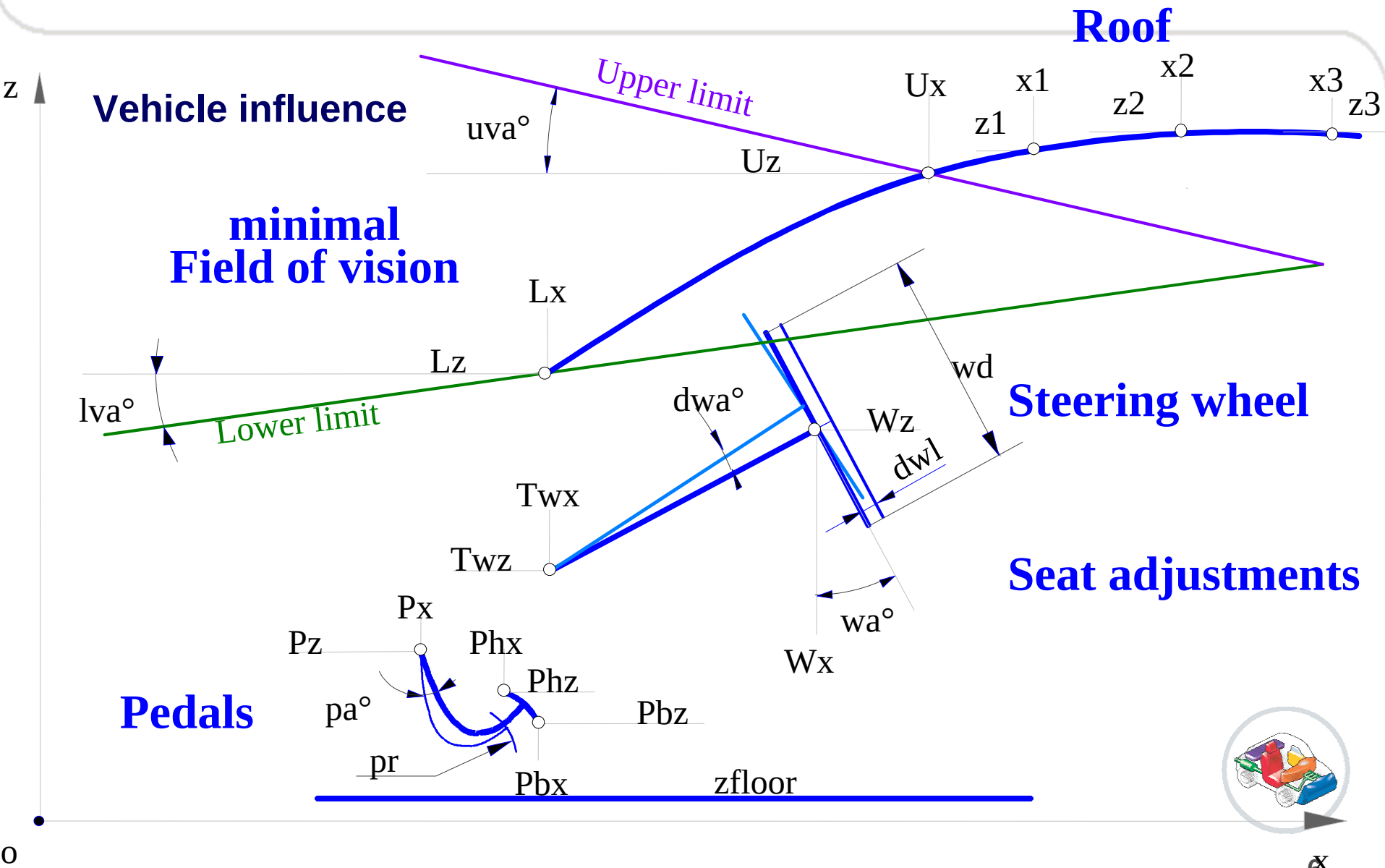

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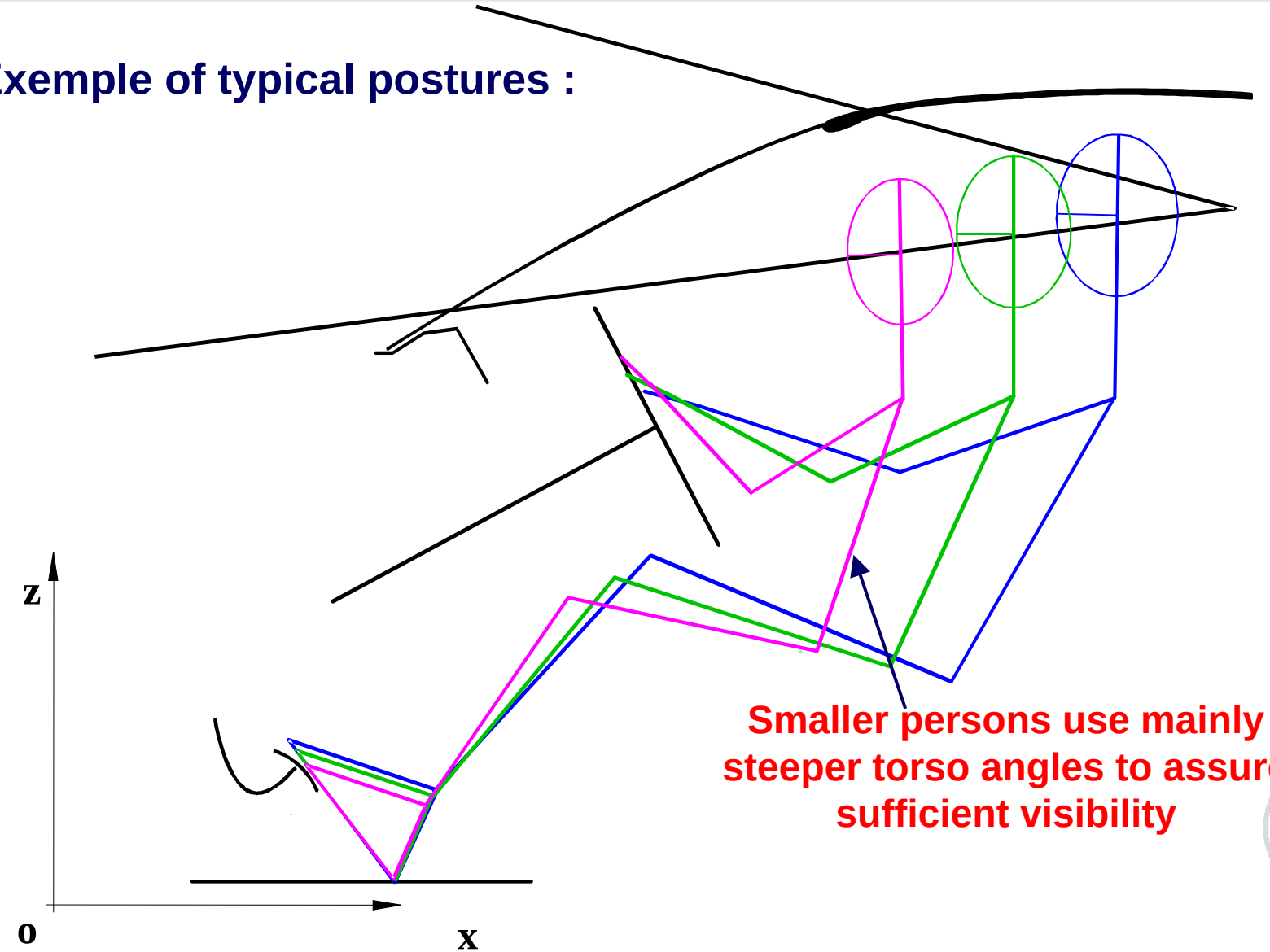
Exemple of typical postures :

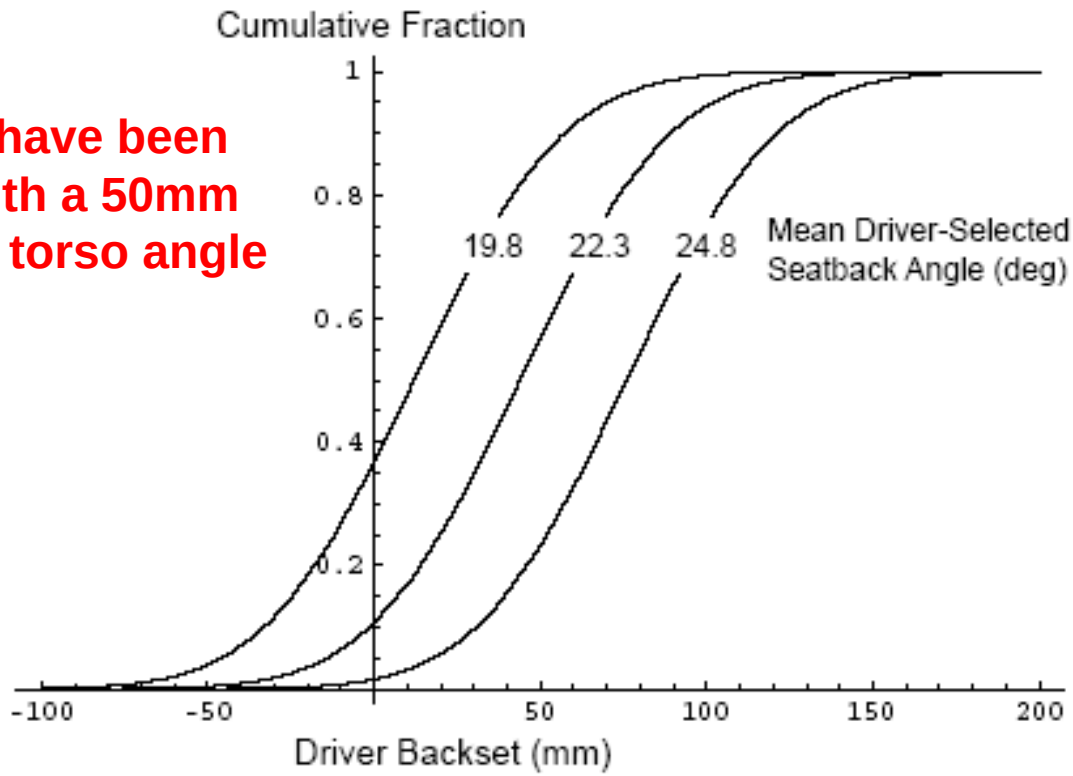


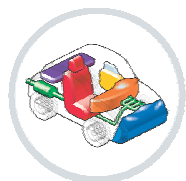
Smaller persons use mainly steeper torso angles to assure sufficient visibility

Anthropometry basis of UMTRI study

- **In reality every occupant adjusts its torso angle and the percentage of occupants which are in interference with the head restraint depends on the mean driver selected seat back angle :**

This curves have been calculated with a 50mm backset at 25° torso angle





Conclusions

Need to enlarge requested backset of 55mm to accommodate persons in vehicles where the design torso angle is smaller than 25°.

References : MODELING VEHICLE OCCUPANT HEAD AND HEAD RESTRAINT POSITIONS, UMTRI, M.P. Reed et al., 2001