

GTR Head Restraints
-Discussion of Height Measurement Method-

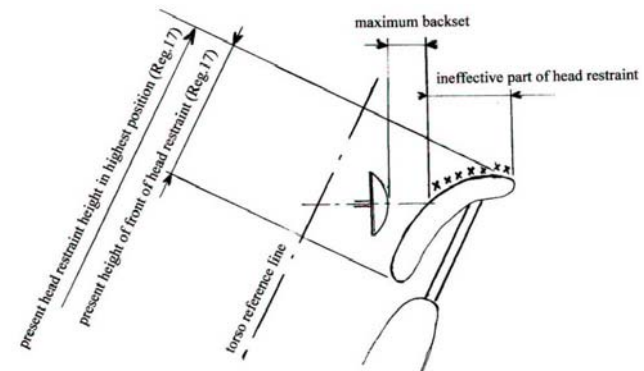
Task Force by RDW, BaSt, OICA

June, 10th 2011

Background

- The Netherlands proposed to update the head restraint height measuring method and to include a backset measurements for different occupant sizes
- A task force (current members: RDW, BaSt and OICA) is reviewing the measure method
- For the definition of the backset for different occupant sizes, a correlation between backset and occupant size was investigated
- OICA data collection showed no clear correlation between head position and occupant size
- A new, more simple measuring method was developed and discussed, with regard to:
 - backset for midsize (50%) and larger (95%) occupants
 - prevention of head restraint designs with „ineffective“ height
 - prevention of overlapping / intersection with child restraints on rear seats

“ineffective” head restraint area

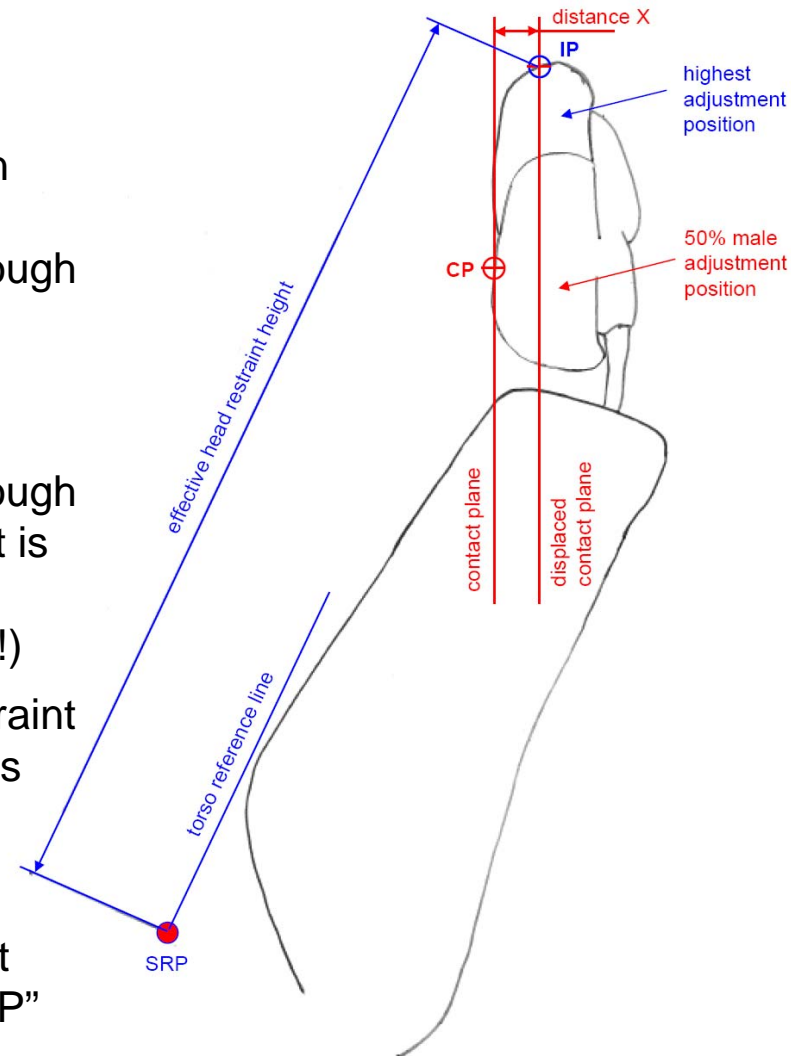


Discussion height measuring method

- Definition of „contact point“ (CP):
 - for front head restraints: CP is the intersection point between the front surface of the head restraint and the horizontal plane passing through the sliding scale of the HRMD head
 - for rear head restraints: CP is the intersection point between the front surface of the head restraint and the horizontal plane passing through the sliding scale of the HRMD head (this point is only used for determination of head restraint height and does not include a backset criteria!)

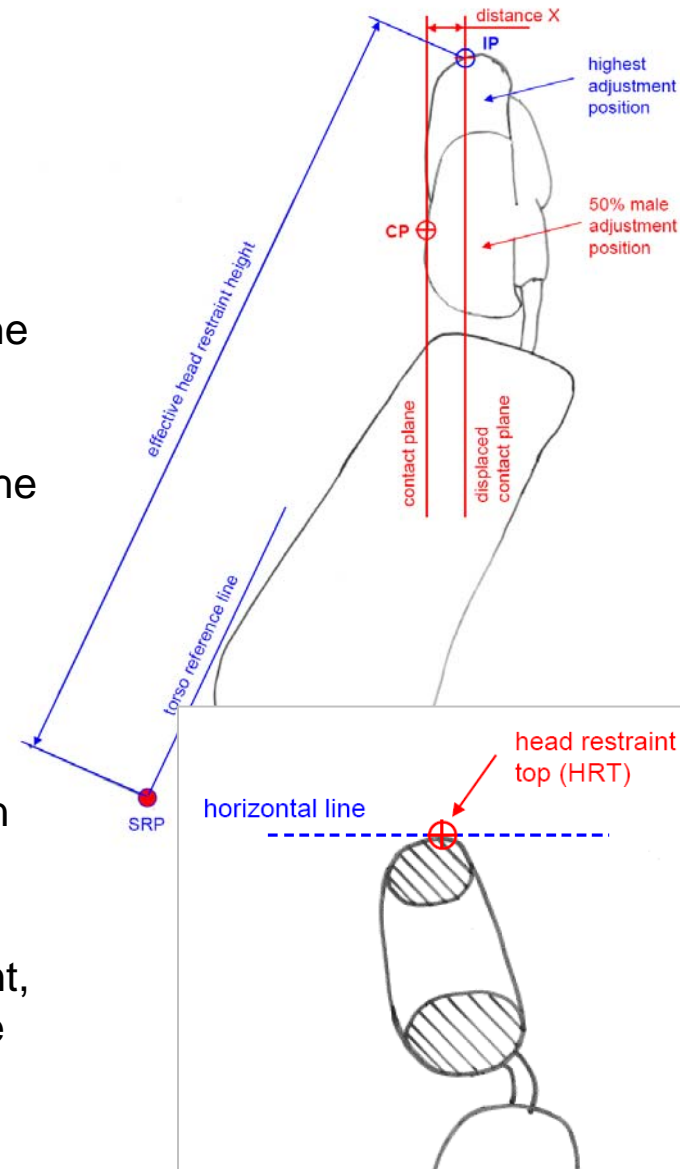
The contact point is measured with the head restraint in the position intended for use for a 50% male, as defined by the manufacturer

- Definition of “contact plane”:
A vertical, transverse plane which contacts the front surface of the head restraint at the contact point “CP”



Discussion height measuring method

- “displaced contact plane”: is a perpendicular, transverse plane, parallel to the contact plane, with a distance X to the contact plane in rearward direction
- “distance X ”: is the distance value between the rear of the head of a 50% male and a 95% male as defined by the head restraint measuring apparatus’ which represent a 50% and a 95% male. The distance X is depending on the torso angle (see formulas / see table for value X in dependence of torso angle)
- “intersection point” (IP): is the upper intersection of the backset plane with the head restraint surface contour
- determination of the intersection point: the IP is determined with the head restraint in the highest position (and if applicable mid tilt and/or mid longitudinal and/or mid upper backrest tilt - details to be discussed) -
- “head restraint top” (HRT): is the top of the head restraint, defined as the highest point of the head restraint surface contour in a vertical, longitudinal plane which intersects the torso reference point.



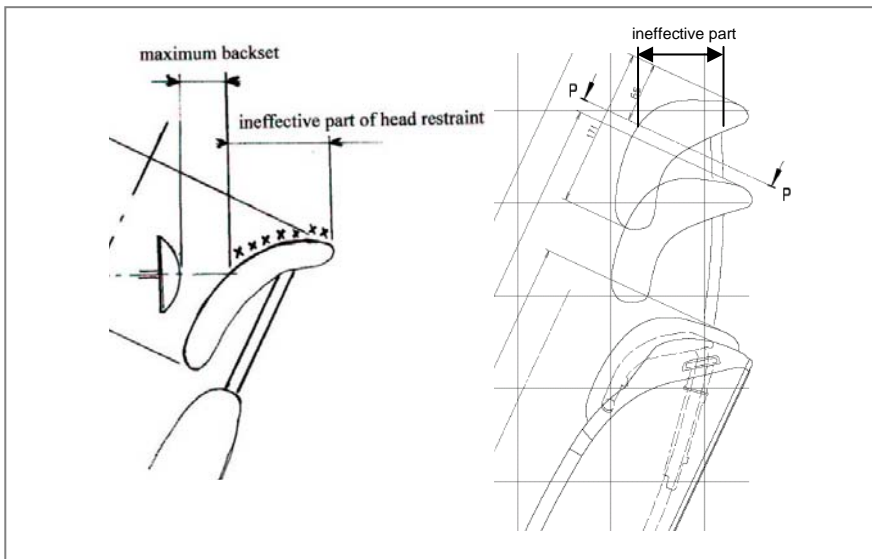
Discussion height measuring method

- “effective head restraint height”: is the distance from the R-point, measured in a longitudinal plane intersecting the R-point, measured parallel to the torso line and limited by a line perpendicular to the torso line which is intersecting the intersection point IP

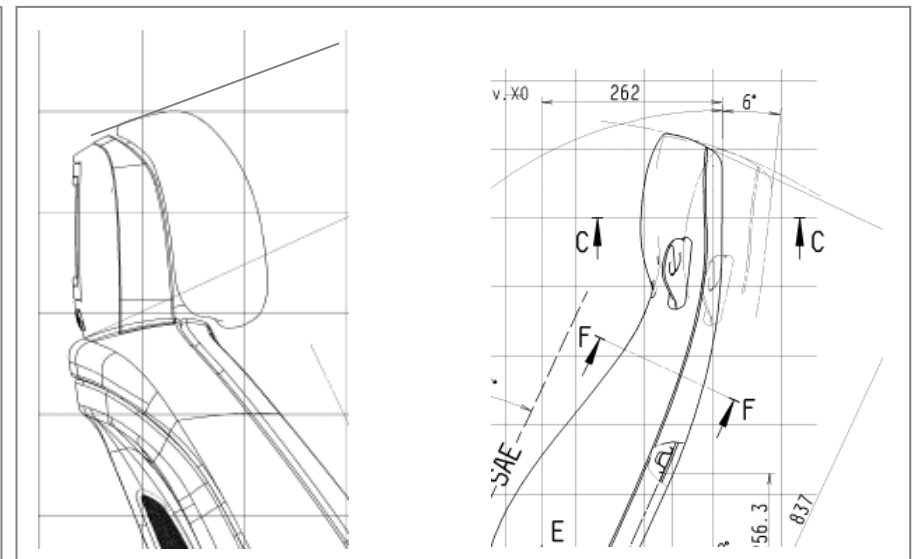
Equivalence of height measuring methods (1)

- In some cases, the head restraint height is measured far behind the front surface. An example is, if the radius between front and upper surface of the head restraint is large.
- In such cases, an “ineffective part” of the head restraint could count to the measured height.
- Rounded head restraints are sometimes used on rear seats, while common front head restraint design have more edged surfaces.

Examples:



Rounded rear head restraint



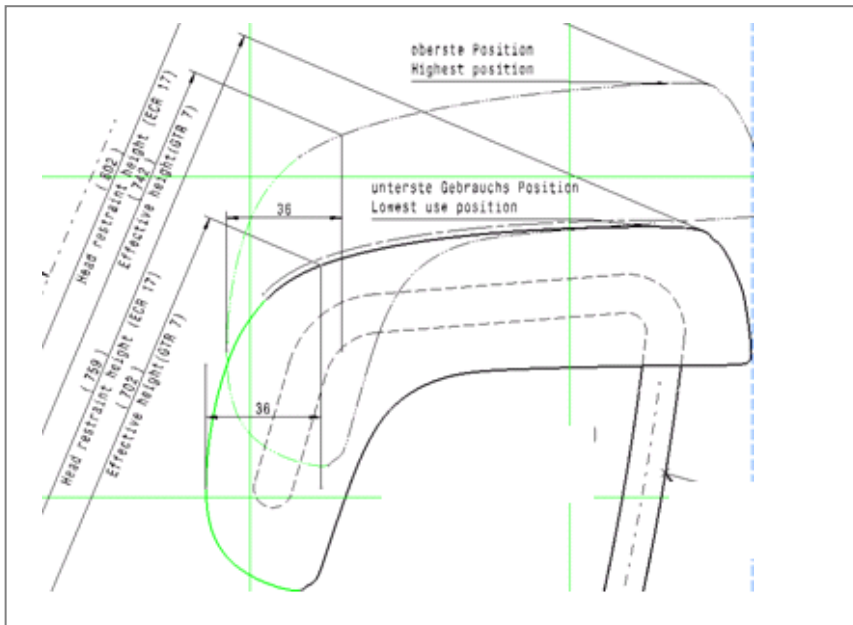
Typical front head restraints

Equivalence of height measuring methods (2)

The proposed new measuring method of head restraint height will lead to different measurement values

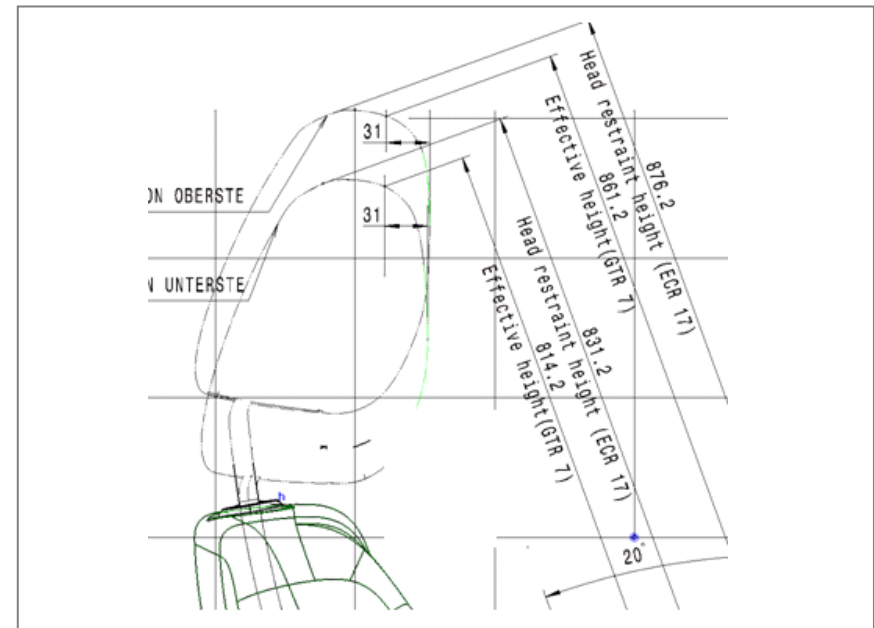
Rounded head restraints are more effected

Examples:



Rear head restraint:

The height difference between current ECE R17 and discussed GTR7 method i. For measured vehicles it is up to 60 mm

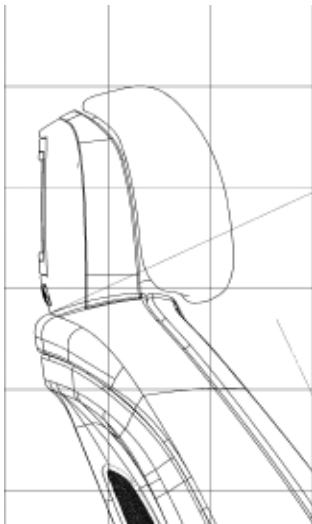


Front head restraint:

Height difference between current ECE R17 and discussed GTR7. For measured vehicles it is between 15 and 25 mm

Equivalence of height measuring methods (3)

- With the proposed method the nominal value of head restraint height is decreased up to 60 mm if the measuring point is far away from the contact surface.
- The new method will decrease the measured value also for “edged” head restraint designs by an average value of approx. 20 mm for the measured vehicles



Equivalence of methods:

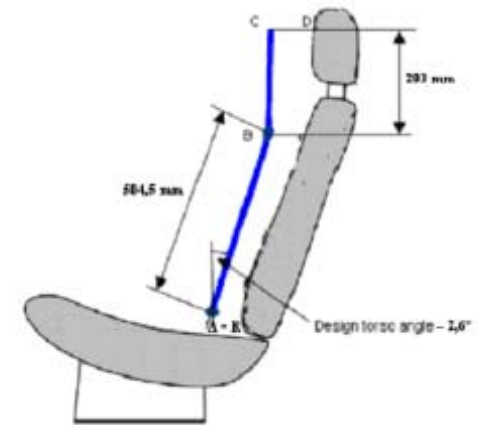
Example:

The current height level of e.g. **800 mm (according to ECE R17 method)** for front head restraints **is equivalent to** an “effective height” value of **780 mm (according to proposed GTR7 method and based on the measured vehicles)**. Both values give the same safety level and therefore are equivalent.

For the discussion of the required minimum head restraint height values in GTR7 the above mentioned fact of equivalence has to be taken into account, if the height measuring method should be changed.

Backset for taller occupants

- Definition of “distance X” of two perpendicular planes as backset for taller occupants by:
 - defining contact point CP as contact point of HRMD head (50% male)
 - defining distance X as backset difference between 50% and 95% male, based on backset measuring apparatus for 50% (GTR 7, annex 5) and upscaled 95% apparatus
 - according to the definition of the backset measuring apparatus, the back of the head is depending on the torso angle
 - variable value / limit for distance X in dependance of design torso angle
- Definition of „distance X“ in GTR 7 by formulas or by a table (distance X in dependance of torso angle):



backset measuring apparatus
(GTR 7, annex 5)

- X position of 50% head: $X - coordinate = 504.5 * |\sin (torso\ design\ angle - 2.6^\circ)| + 71$
- X position of 95% head: $X - coordinate = 593 * |\sin (torso\ design\ angle - 2.6^\circ)| + 76$

torso angle [°]	20	21	22	23	24	25	26	27	28	29	30
backset 50% [mm]	222	230	239	247	255	263	271	279	287	295	303
backset 95% [mm]	253	263	273	283	292	302	312	321	330	340	349
distance X [mm]*	31	33	34	36	37	39	40	42	43	44	46

* values to be discussed

Open issues and answers

A) Why change the procedure?

→ NL wants to prevent measurement of ineffective height

B) Will the geometry check be done in drawings? How to consider the 95% male?

→ Check with CAD drawings

→ measurement with 95% HPM and HRMD is not necessary, because the distance X is based on the theoretical models of the backset measuring apparatus'

C) How can 2nd row in- and egress still be secured in two door cars?

→ for adjustable headrests: soft locks are accepted for geometry requirements for height positions that intersect the roof in any position in the H-Point field during folding of the seat

→ For integrated headrests: lower height limit defined by no contact to the roof during folding in 3/4 of the H-Point field

D) How can low roofs be regarded?

→ height limits reduced as in ECE-R 17 today

E) How can passenger size limits (e.g. 3rd row only up to 1,60 m) be regarded?

→ Adjustment of the formula to calculate alternative CPs and IPs

Next steps

Discussion and decisions in next Task Force Meeting (XX XX, 2011):

- Investigation of proposed measuring methods
 - find out consequences for different head restraint designs
 - find out consequences on head restraint height and width as basis for value / limit discussion
- Further development and improvement of proposal
 - improvement of method based on further investigations
 - first discussions on new thresholds if the new test procedure will be used
- Possible interference of child restraints and (rear) head restraints:
 - interference with child restraint fixtures (CRFs) from ECE R16
 - interference with child's head for taller children on booster seats (with/without backrest)
 - Prevention of interference with child restraints in head restraint GTR by:
 - Defining contact point (CP) as first contact point for rear seats (excluding backset criteria for rear seats) - or
 - Defining CP as HRMD contact point (like for front seats), but without a backset criteria

Discussion and decisions in next Informal Working Group Meeting (June 10, 2011):

- discussion of necessity of new measuring methods
- discussion of necessity of higher head restraints (based on accident data, ...)
- decision for possible new minimum head restraint height value because new method will lead to other head restraint height values, which can not be compared with current values.