

### Static geometric measurements on head restraints

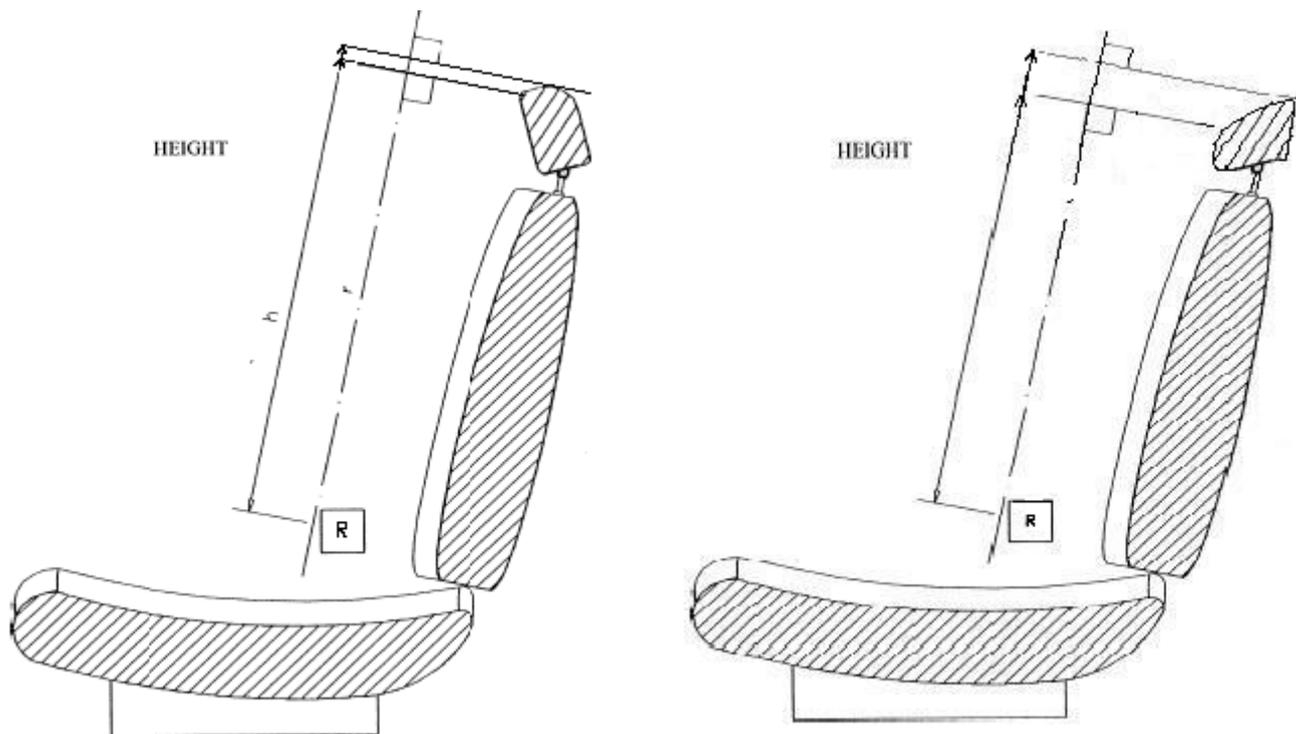
This document is a further explanation of the comments from the Netherlands on measuring techniques during the GTR head restraints meeting February 2005

#### PART A: Static measurement procedure for height of head restraints

##### Experience gained

In a number of cases we found that the measurement of the maximum (adjustable) height of a head restraint is misleading because it includes “height” which is considered not to be relevant for protection.

The following figures illustrate clearly our problem with the present definition of the top of the head restraint!



In the following two examples of regulations the weak spot in the wording is in bold print:

*example copied from UN-ECE Reg.17*

6.5.Determination of the height of the head restraint

6.5.1. All lines, including the projection of the reference line, shall be drawn in the vertical median plane of the seat or seating position concerned, the intersection of such plane with the seat determining the contour of the head restraint and of the seat-back (see figure 1 of annex 4 to this Regulation).

6.5.2. The manikin described in annex 3 to this Regulation shall be placed in a normal position on the seat.

6.5.3. The projection of the reference line of the manikin shown in annex 3 to this Regulation is then, in the seat concerned, drawn in the plane specified in paragraph 6.4.3.1. above.

The tangent S to the **top of the head restraint** is drawn perpendicular to the reference line.

6.5.4. The distance "h" from the R point to the tangent S is the height to be taken into consideration in implementing the requirements of paragraph 5.5. above.

*example copied from NHTSA final rule 202a*

*S5.2.1 Procedure for height*

*measurement.* Demonstrate compliance with S4.2.1 of this section in accordance with S5.2.1 (a) and (b) of this section, using the scale incorporated into the SAE J826 (rev. Jul 95) manikin or an equivalent scale, which is positioned laterally within 15 mm of the head restraint centerline. If the head restraint position is independent of the seat back inclination position, compliance is determined at a seat back inclination position closest to 25 degrees from vertical, and each seat back inclination position less than 25 degrees from vertical.

(a)(1) For head restraints in front outboard designated seating positions, **adjust the top of the head restraint to the highest position and measure the height.**

(2) For head restraints located in the front outboard designated seating positions that are prevented by the vehicle roofline from meeting the required height as specified in S4.2.1(a)(1), measure the clearance between the top of the head restraint and the roofline, with the seat adjusted to its lowest vertical position intended for occupant use, by attempting to pass a 25 mm sphere between them. Adjust the top of the head restraint to the lowest position and measure the height.

(b)(1) For head restraints in all outboard designated seating positions equipped with head restraints, adjust the top of the head restraint to the lowest position other than allowed by S4.4 and measure the height.

(2) For head restraints located in rear outboard designated seating positions that are prevented by the vehicle roofline or rear backlight from meeting the required height as specified in S4.2.1(b)(1), measure the clearance between the top of the head restraint or the seat back and the roofline or the rear backlight, with the seat adjusted to its lowest vertical position intended for occupant use, by attempting to pass a 25 mm sphere between them.

### **First conclusions**

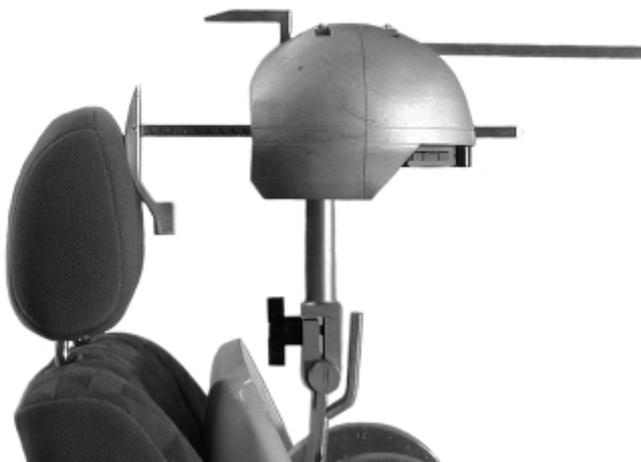
- Although the latter regulation makes use of a different measuring tool, we conclude that both regulations only focus on the uttermost height of the head restraint;
- We judge it important that the measurement procedure for the height of a head restraint leads to the determination of a maximum height being that part of the head restraint which is relevant for, **close enough to!**, the head that has to be protected;
- Therefore a measurement procedure for maximum height of head restraints should be **related to backset**. In other words the height that will be determined as the maximum height of the head restraint should have a backset which is not bigger than .. mm when compared with the backset determined by the probe imitating the rear of the human head;
- Furthermore, this concept should also count for a part of the front surface of the head restraint hereafter called *Catching Zone*;
- The dimensions of the *Catching Zone* can be derived from existing requirements concerning the minimum width and height of head restraints.

### **PART B: Static measurement procedure for backset of head restraints**

#### **Observation:**

The criterion on backset is promising. Studying existing rules e.g. the following device (copied from IIHS web site) in combination with the following rules (copied from USA Federal Register) some questions rise.

## Head Restraint Backset Measurement



### S3. Definitions.

*Backset* means the minimum horizontal distance between the rear of a representation of the head of a seated 50th percentile male occupant and the head restraint, as measured by the head restraint measurement device.

S5.2.3 *Procedure for backset measurement.* Demonstrate compliance with S4.2.3 of this section using the HRMD positioned laterally within 15 mm of the head restraint centerline. Adjust the front head restraint so that its top is **at any height** between and inclusive of 750 mm and 800 mm and its backset is in the maximum position other than allowed by S4.4. If the lowest position of adjustment is above 800 mm, adjust the head restraint to that position. If the head restraint position is independent of the seat back inclination position, compliance is determined at each seat back inclination position closest to and less than 25 degrees from vertical.

### Risen questions/ideas:

- As it is now interpreted by us there is no link between the measured height and backset.
- Elsewhere in the above mentioned rules the HRMD is said to be based on the SAE J826 manikin (plus a Head Restraint Measuring Device), alas the original setting of the SAE J826 representing a 50<sup>th</sup> percentile male is based on data acquired by Geoffrey in 1961. However to provide proper protection a setting should be used which covers people of today and this should not be restricted to the 50<sup>th</sup> percentile male of today!
- It seems not clear to us whether the backset requirements could be satisfied with just one measurement in the prescribed zone ( $750\text{mm} \leq \text{zone} \leq 800\text{mm}$ ). We would like to prevent problems because of sub-optimising and out-of-position therefore the concept of a *Catching Zone* seems promising.

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