A.   STATEMENT OF TECHNICAL RATIONALE AND JUSTIFICATION

It is under study by the Netherlands which paragraph's should be changed and supplemented with new information. However, we think this is a process that should be undertaken by a team in order that the people who finally have to use the new method will have a balanced and robust base.

B.   TEXT OF THE REGULATION

This proposal was elaborated in the Task Force - head restraint height measuring method, together with OICA members and it aims on improving the method of measuring the height of head restraints.

This proposal has taken on board comments of participating members of the latest workshop held on 3 November at TNO in Helmond, but up to the moment Netherlands has sent this doc. to the chair of the Informal Group of gtr No7 phase7, no comments of OICA were received. Therefore OICA may still have some comments.

Because the proposal is restricted to the measuring method you will find this proposal concerns only Annex 1.

The Netherlands is still of the opinion that the actual requirements for the height of head restraints, that are laid down in "paragraph 5. Performance Requirements", have to be improved too. However, the height as such was not a subject for the GTR7 Task force group. We believe the actual height stays more an item where gtr7 could give an advice and GRSP should decide.

Annex 1

~~MINIMUM~~ HEIGHT MEASUREMENT TEST PROCEDURE USING THE R-POINT METHOD

1.   PURPOSE

The purpose of this test procedure is to demonstrate compliance with the minimum height requirements described in paragraph 5.1.1. of this regulation.

2.   PROCEDURE FOR HEIGHT MEASUREMENT USING R-POINT AS THE REFERENCE POINT

Compliance with the requirements of paragraph 5.1.1. of this regulation is demonstrated by using the height measurement ~~apparatus defined~~ **as described** in paragraph 2.2. **and 2.3.** below.

The seat is adjusted such that its H-point coincides with the R- point; if the seat back is adjustable, it is set at the design seat back angle; both of these adjustments are in accordance with the requirements of paragraph 2.1. below. ~~The height of the head restraint is the distance between point A and the intersection of lines AE and FG.~~

2.1.   Relationship between the H-point and the R-point

When the seat is positioned in accordance to the manufacturer's specifications, the H-point, as defined by its coordinates, shall lie within a square of 50 mm side length with horizontal and vertical sides whose diagonals intersect at the R-point, and the actual torso angle is within 5 degrees of the design torso angle.

2.1.1. If these conditions are met, the R-point and the design torso angle are used to determine the height of the head restraints in accordance with this Annex.

2.1.2. If the H-point or the actual torso angle does not satisfy the requirements of paragraph 2.1., the H-point and the actual torso angle are determined twice more (three times in all). If the results of two of these three operations satisfy the requirements, the conditions of paragraph 2.1.1. shall apply.

2.1.3. If the results of at least two of the three operations described in paragraph 2.1.2. do not satisfy the requirements of paragraph 2.1. the centroid of the three measured points or the average of the three measured angles is used and be regarded as applicable in all cases where the R-point or the design torso angle is referred to in this Annex.

2.1.4. If, elsewhere during head restraint testing, the H-point and actual torso angle have been found in accordance with paragraph 2.1. it does not need to be repeated for the height measurement test procedure of this Annex.

2.2.   Height measuring apparatus
The height measurement ~~apparatus consists of~~ **is based on the usage of apparatus that facilitate the measurement of coordinates** ~~(see Figure 1-1):.~~

2.2.1. ~~A straight edge AE. The lower point A is placed at the R-point location in accordance with paragraph 2.1. of this Annex. The line AE is parallel to the design torso angle.~~

2.2.2. ~~A straight edge FG, perpendicular to the line AE and in contact with the top of the head restraint. The height of the head restraint is the distance between point A and the intersection of the lines AE and FG.~~

2.3. ~~Height measurement~~ **Height measurement** ~~for front outboard head restraints~~
All measurements shall be taken in the median longitudinal plane of the seat or seating position.

2.3.1. ~~If adjustable, adjust the top of the head restraint to the highest position and measure the height.~~
Determination of contact point CP (see Figure 1-1)
~~If adjustable, adjust the top of the head restraint to the lowest position intended for normal use, other than any non-use position described in paragraph 5.4. of this regulation, and measure the height.~~
Adjust the head restraint to the position intended for use by the mid-sized male[1], as specified by the manufacturer. In the absence of any specification, the head restraint is to be adjusted as close as possible to the mid position. If two positions of adjustment are equidistant from the mid position, the head restraint is adjusted to the higher of the mid position and/or rear of the mid position.

For head restraints not adjustable for height, the fixed position is to be used.

If there is only one in-use position, this is regarded as a head restraint not adjustable for height.

CP is determined being the intersection of a horizontal line, on the height of the Z-coordinate of the back-of-head of the mid-sized male (as provided by table 1), with the front surface of the head restraint as indicated in Figure 1-1.

Where CP cannot be determined because the horizontal line through the back-of-head of the mid-sized male is located above the head restraint, the head restraint must be raised to the next locking position to enable the determination of point CP.
[In the case even this will not produce a point of intersection, both CP and IP will be appointed at the horizontal top of the head restraint (see Figure 1-4).]

2.3.2. **Determination of intersection point IP**

Adjust the head restraint to the uppermost position. If the head restraint is tiltable or adjustable fore-and-aft, the tilt and fore-and-aft adjustment used for the determination of CP will be kept.

IP is determined on the front surface of the head restraint as the intersection with a vertical line rearwards of CP (see Figure 1-2) at the "distance x" (as provided by table 1).
For head restraints not adjustable for height, IP is to be determined in the fixed position.

Where IP would be located rearwards of the horizontal top of the head restraint, IP will be appointed at the horizontal top of the head restraint (see Figure 1-4).

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[1] The back-of-head of the mid-sized male is represented by the HRMD attached to the three-dimensional H-point machine, as well as by the Torso & Neck Link with the head room probe fitted 71 mm rearwards (see Figure 1).

HEAD POSITION TABLE **Location of the back-of-head of two designated males in automotive posture** **with respect to the R-point at several design torso angles,** **and their in-between "distance x"**			
Design torso angle	X-coordinate of back-of-head calculated for the mid-sized male	Z-coordinate of back-of-head calculated for the mid-sized male	X-coordinate of back-of-head calculated for large male [2]	"Distance x": distance between X-coordinates of back-of-head of both males
	504.5*sin(design torso angle - 2.6)+71	504.5*cos(design torso angle - 2.6)+203	593*sin(design torso angle - 2.6)+76	
5	92	707	101	9
6	101	707	111	10
7	110	706	121	12
8	118	705	132	13
9	127	704	142	15
10	136	703	152	16
11	145	702	163	18
12	153	701	173	19
13	162	699	183	21
14	171	698	193	22
15	179	696	203	24
16	188	694	213	26
17	196	692	223	27
18	205	689	233	29
19	213	687	243	30
20	222	684	253	31
21	230	682	263	33
22	239	679	273	34
23	247	676	283	36
24	255	673	292	37
25	263	669	302	39
26	271	666	312	40
27	279	662	321	42
28	287	659	330	43
29	295	655	340	44
30	303	651	349	46

Table 1

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[2] The large male is represented by a virtually upscaled Torso & Neck Link; where the mid-sized male version of the Torso & Neck Link measures 504.5 mm & 203 mm with the head room probe 71 mm rearwards, the upscaled version for the large male measures respectively 593 mm & 219 mm with the head room probe 76 mm rearwards.

2.3.3.   **Determination of the highest head restraint height**

The head restraint height is the distance from the R-point, parallel to the torso reference line and limited by a line perpendicular to the torso reference line intersecting IP (see Figure 1-3).

After the coordinates of IP are determined, the highest head restraint height can be calculated by its longitudinal (ΔX) and vertical (ΔZ) distance from the R-point (see Figure 1-3), as follows:

Head restraint height =

ΔX · SIN(design torso angle) + ΔZ · COS(design torso angle)

2.3.3.1.   **Determination of the highest head restraint height for front outboard head restraints in case of exception according paragraph 5.1.1.4.**

~~2.3.2.~~   For front outboard head restraints that are prevented by the interior surface of the vehicle roofline from meeting the required height as specified in paragraph 5.1.1.2. of this regulation, the requirements of paragraph 5.1.1.4. of this regulation are assessed by the following procedure:

~~2.3.2.1.~~ Adjust the head restraint to its maximum height and measure the clearance between the top of the head restraint and the interior surface of the roofline or the rear backlight, by attempting to pass a 25 ± 0.5 mm sphere between them. In the case of convertibles, the diameter of the sphere is 50 ± 0.5 mm.

~~2.4.   Height measurement for front centre and rear outboard head restraints~~

2.3.3.2.   **Determination of the highest head restraint height for front centre and rear outboard head restraints in case of exception according paragraph 5.1.1.4. respectively 5.1.1.6.**

~~2.4.1.~~   ~~If adjustable, adjust the top of the head restraint to the lowest position of adjustment intended for normal use, other than any non-use position described in paragraph 5.4. of this regulation and measure the height.~~

~~2.4.2.~~   For head restraints that are prevented by the interior surface of the vehicle roofline or rear backlight from meeting the required height as specified in paragraphs 5.1.1.3. or 5.1.1.5. of this regulation, the requirements of paragraphs 5.1.1.4. and 5.1.1.6. are assessed by the following procedure:

~~2.4.2.1.~~ If adjustable, adjust the head restraint to its maximum height and measure the clearance between the top of the head restraint or the seat back at all seat back angles for intended use and the interior surface of the roofline or the rear backlight, by attempting to pass a 25 ± 0.5 mm sphere between them. In the case of convertibles, the diameter of the sphere is 50 ± 0.5 mm.

2.3.4.   **Determination of the lowest head restraint height**

~~2.3.2.2.~~ Adjust the top of the head restraint to the lowest position of adjustment intended for normal use, other than any non-use position described in paragraph 5.8. of this Regulation~~, and measure the height~~.

In this position the head restraint height is the distance from the R-point, parallel to the torso reference line and limited by a line perpendicular to the

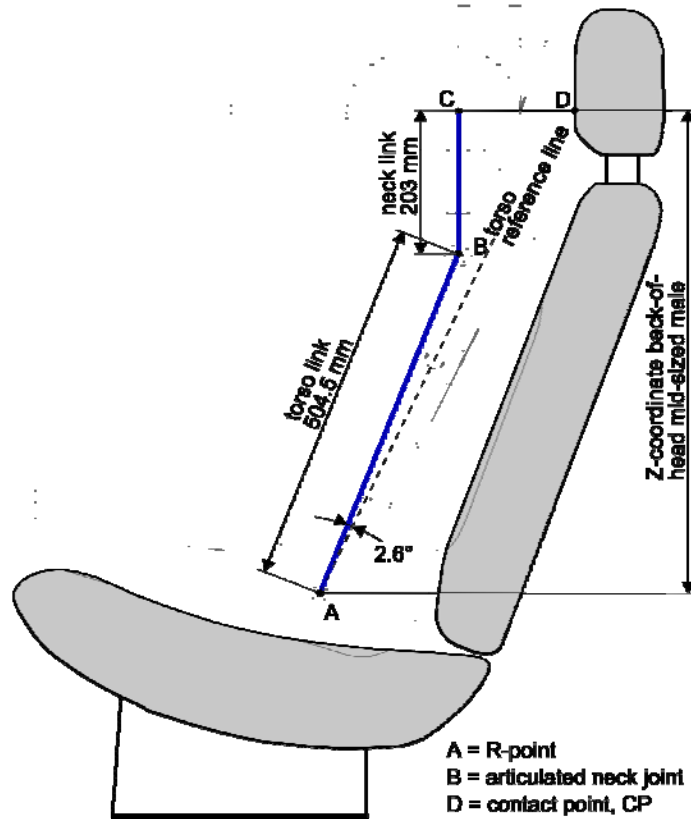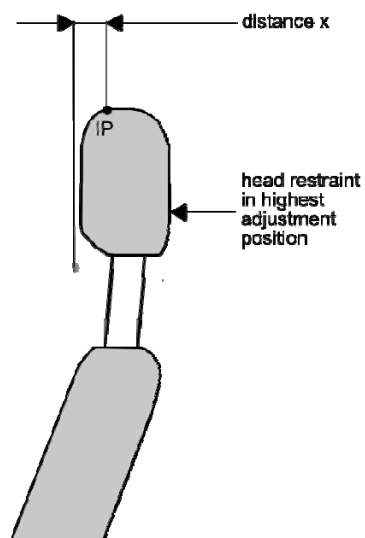**torso reference line intersecting the point IP (as determined in paragraph 2.3.3.) in its lowered position.**
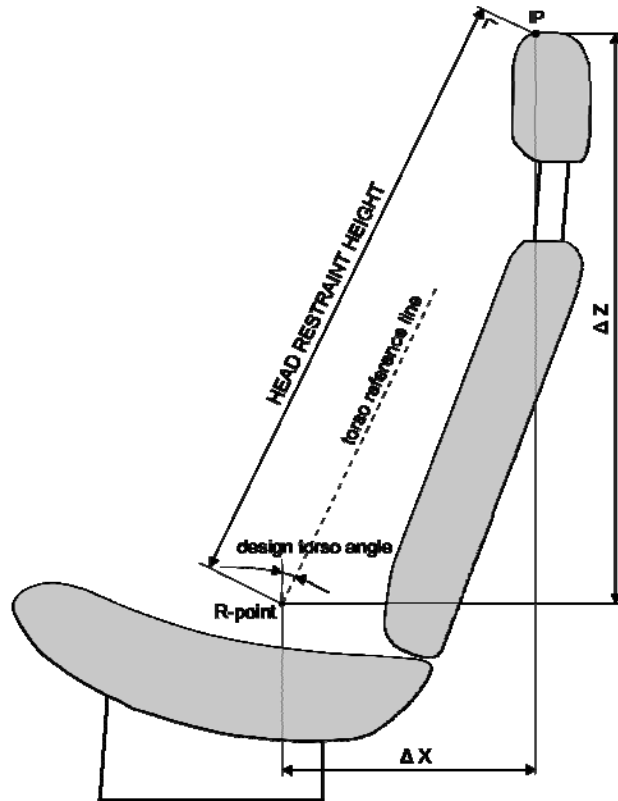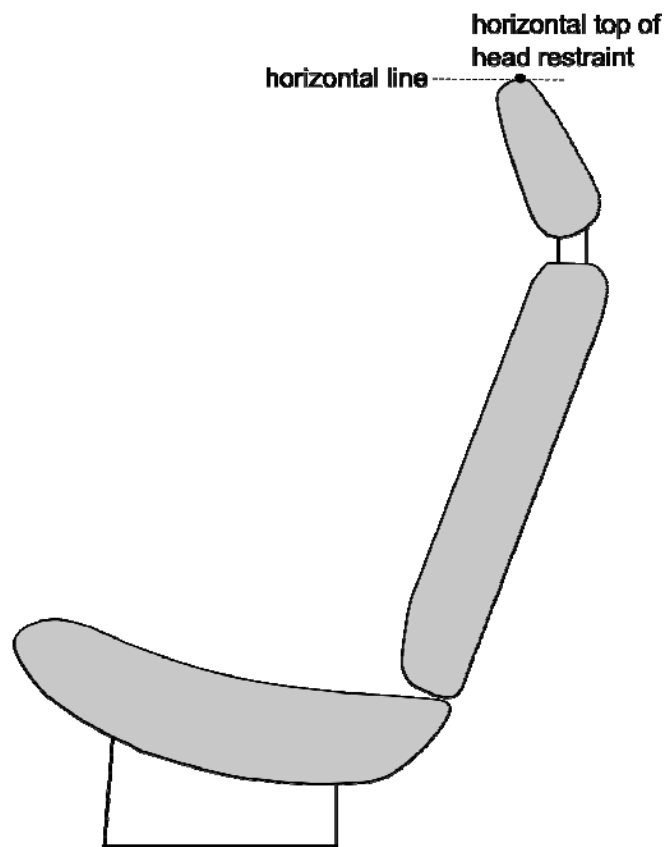

Figure 1-1

Figure 1-2

Figure 1-3

Figure 1-4