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World Forum for Harmonization of Vehicle Regulations

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1998 AGREEMENT

CONSIDERATION AND VOTE OF DRAFT GLOBAL TECHNICAL REGULATIONS AND/OR DRAFT AMENDMENTS TO ESTABLISHED GLOBAL TECHNICAL REGULATIONS

Proposal for a draft global technical regulation concerning head restraints

Final progress report of the informal working group on head restraints

Submitted by the Working Party on Passive Safety */

The text reproduced below was adopted by the Working Party on Passive Safety (GRSP) at its forty-second session (ECE/TRANS/WP.29/GRSP/42, para. 20). It is submitted to the Executive Committee of the 1998 Agreement (AC.3) with the recommendation to establish it in the Global Registry by vote.

*/ In accordance with the programme of work of the Inland Transport Committee for 2006-2010 (ECE/TRANS/166/Add.1, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance performance of vehicles. The present document is submitted in conformity with that mandate.

I. INTRODUCTION

1. During the one-hundred-twenty-sixth session of the World Forum for Harmonization of Vehicle Regulations (WP.29) of March 2002, the Executive Committee of the 1998 Agreement (AC.3) adopted a Program of Work, which includes the development of a global technical regulation (gtr) to address neck injuries in crashes. The United States of America volunteered to lead the group's efforts and develop a document detailing the recommended requirements for the gtr. The United States of America presented an informal document (WP.29-134-12) in November 2004 proposing the work and highlighting the relevant issues to be addressed in the gtr. This proposal was adopted at the March 2005 session of WP.29 (TRANS/WP.29/AC.3/13).

2. At the November 2004 WP.29 session, the Executive Committee charged the Working Party on Passive Safety (GRSP) to form an informal group on Head Restraints (informal group) to discuss and evaluate relevant issues concerning requirements for head restraints to make recommendations regarding a potential gtr.

3. Under the guidelines governing the development of a gtr, the GRSP is to first evaluate the merits of the proposal. This evaluation should include:

(a) An examination of the merits of the proposal in detail, outlining the pros and cons of the proposal;
(b) Consideration of other regulations on the same subject, which are listed in the Compendium of Candidates global technical regulations;
(c) A determination that the proposal addresses a problem of sufficient magnitude to warrant the development of a regulation;
(d) An examination of whether the nature, extent and cause of the problem addressed by the proposal are correctly characterized;
(e) An examination of whether the proposal provides a sufficiently effective, performance oriented approach to address the problem;
(f) A determination that the approach identified in the proposal is appropriate to address the problem; and
(g) A description of needed additional information.

4. The informal working group met to discuss the development of a gtr on head restraints on:
1-2 February 2005 in Paris, France
11-13 April 2005 in Paris, France
13-15 June 2005 in Washington, D.C., United States of America
7-9 September 2005 in Paris, France
23-26 January 2006 in Cologne, Germany
19-21 April 2006 in London, United Kingdom
12-14 September 2006 in Montreal, Canada
7-8 December 2006 in Paris, France
8-9 November 2007 in Basildon, United Kingdom
10-11 December 2007 in Geneva, Switzerland.

5. The Contracting Parties represented on the informal working group were the Netherlands, France, Canada, Japan, Germany, Korea, Spain, United Kingdom of Great Britain and Northern Ireland, United States of America, and the European Commission.

6. Representatives from the European Association of Automotive Suppliers (CLEPA) and International Organization of Motor Vehicle Manufacturers (OICA) were also participants.

7. This report summarizes the main issues discussed by the informal group in evaluating the proposal to develop a draft global technical regulation on head restraints.

II. REQUEST TO PROCEED WITH THE DRAFTING OF A GTR

8. In December 2004, the United States of America upgraded its head restraint standard to provide more stringent requirements. In 1982, the United States of America assessed the performance of head restraints installed pursuant to the current standard and reported that integral head restraints are 17 per cent effective at reducing neck injuries in rear impacts and adjustable head restraints are only 10 per cent effective. The UNECE Regulations on head restraints were considerably more stringent than the old United States of America regulation, and were used as a baseline in developing the new upgraded United States of America head restraint regulation.

9. Due to the United States of America regulatory upgrade effort, it was believed that this would be an excellent opportunity for the international community to develop and establish a gtr in this area. It is the belief of the informal group that everyone could benefit from harmonization and new technology based improvements of head restraints. The benefits to the governments would be the improved safety of the head restraints, leveraging of resources, and the harmonization of requirements. Manufacturers would benefit from reduction of the cost of development, testing, and fabrication process of new models. Finally, the consumers would benefit by having a choice of vehicles built to higher, globally recognized standards, providing a better level of safety at a lower price.

10. The gtr was developed per the following schedule:

Tasks	Dates
1st Progress Report to GRSP	May 2005
1st Progress Report to AC.3	June 2005
Development of draft gtr begins	June 2005
2nd Progress Report to GRSP	December 2005
2nd Progress Report to AC.3	March 2006
3rd Progress Report and Draft gtr to GRSP	May 2006
3rd Progress Report to AC.3	June 2006
4th Progress Report/Draft gtr to GRSP	December 2006
Formal gtr to GRSP (9th Informal working group Meeting)	May 2007
4th Progress Report to AC.3	June 2007
Final Progress Report and formal gtr to GRSP	December 2007
Submittal of Final gtr and Final Report to AC.3	March 2008

III. EVALUATION OF THE SAFETY PROBLEM

11. In the United States of America, between 1988 and 1996, 805,581 whiplash injuries (non-contact Abbreviated Injury Scale (AIS)1 neck) occurred annually in all crashes of passenger cars and LTVs (light trucks, multipurpose passenger vehicles and vans). 272,464 of these whiplash injuries occurred as a result of rear impacts. For rear impact crashes, the average cost of whiplash injuries in 2002 dollars is $9,994 (which includes $6,843 in economic costs and $3,151 in quality of life impacts, but not property damage), resulting in a total annual cost of approximately $2.7 billion. Although the front outboard seat occupants sustain most of these injuries, whiplash is an issue for rear seat passengers as well. During the same time frame, an estimated 5,440 whiplash injuries were reported annually for occupants of rear outboard seating positions. A more detailed discussion of the safety problem in the United States of America and their requirements in the upgraded FMVSS No. 202 can be reviewed in informal document No. HR-1-8 (HR-1-8).

12. In the European Community, there are over 1 million total whiplash injuries a year and the cost of these injuries in the EC is estimated to be €5 to €10 billion per annum and rising (Kroonenburg and Wismans, 1999). In the United Kingdom the cost of long term injuries alone has been reported as £3 billion. (UK Cost Benefit Analysis**:** Enhanced Geometric Requirements, EEVC Report, September 2007, http://www.eevc.org)

13. In Korea, rear end collisions account for 34 per cent of all car to car collisions and cause 31 per cent of fatalities and 37 per cent of injuries. Additionally, rear impact collisions caused 260,000 neck injuries in 2002 or 57 per cent of all neck injuries in car to car collisions.

14. In Japan, rear impacts account for 31 per cent of collisions resulting in bodily injury. Of these crashes, 91 per cent of the injuries or 309,939 are minor neck injuries. Among rear impact collisions resulting in bodily injury, 81.7 per cent of male and 88 per cent of female drivers of the impacted vehicles sustained minor neck injuries in 2004.

IV. REVIEW OF EXISTING INTERNATIONAL REGULATIONS

15. The following existing regulations, directives, and standards pertain to head restraints:

(a) UNECE Regulation No. 17 - Uniform provisions concerning the approval of vehicles with regard to the seats, their anchorages, and any head restraints
(b) UNECE Regulation No. 25 - Uniform provisions concerning the approval of head restraints (Head Rests), whether or not incorporated in vehicle seats
(c) European Union Directive 74/408/EEC (consolidated), relating to motor vehicles with regard to the seats, their anchorages and head restraints
(d) European Union Directive 78/932/EEC concerning head restraint of seats of motor vehicles
(e) United States Code of Federal Regulations (CFR) Title 49: Transportation; Part 571.202: Head Restraints
(f) Australian Design Rule 3/00, Seats and Seat Anchorages
(g) Australian Design Rule 22/00, Head Restraints

(h) Japan Safety Regulation for Road Vehicles Article 22 – Seat
(i) Japan Safety Regulation for Road Vehicles Article 22-4 – Head Restraints, etc.
(j) Canada Motor Vehicle Safety Regulation No. 202 – Head Restraints
(k) International Voluntary Standards -SAE J211/1 revised March 1995 – Instrumentation for Impact Test – Part 1 – Electronic
(l) Korea Safety Regulation for Road Vehicles Article 99 – Head Restraints

16. Additionally, research and activities being conducted by European Enhanced Vehicle Safety Committee (EEVC) Working Group 12, EEVC Working Group 20, EuroNCAP, Japan NCAP and Korea NCAP were considered.

V. DISCUSSION OF ISSUES TO BE ADDRESSED BY A GTR

17. The following discussions reflect the informal group's identification of specific issues, as well as the group's evaluation of those issues. A draft comparison of the requirements of UNECE Regulation No. 17 and United States FMVSS No. 202 is provided in Appendix 1 to this document. Discussions and recommendations concerning the development of the gtr, which are not already addressed in the technical rational of the gtr, are reflected in this report.

A. Height of the head restraint

1. Front outboard

18. Both UNECE Regulation No. 17 and the FMVSS No. 202 final rule require front outboard head restraints with a minimum height of 800 mm above the R-point/H-point, respectively. A proposal was made to recommend a minimum height of 850 mm, to accommodate the taller citizens of some countries.

19. Data was provided showing that the average sitting height for adults in Netherlands and the United States of America had increased over the last 10 years and a higher head restraint was needed to protect these occupants (HR-3-6 and HR-4-16). Japan presented data (HR-4-10) showing that Japanese females and males were shorter than the United States of America population. They stated that the current height requirement of 800 mm was appropriate and they did not want to raise it to 850 mm. The United Kingdom also submitted data (HR-4-14 and HR-6-11) that showed that, although their population was not increasing in height, they were tall enough to need taller head restraints.

20. Using the Netherlands and the University of Michigan Transportation Research Institute (UMTRI) data for automotive sitting height, it was calculated that a 800 mm head restraint was sufficient to protect up to almost a 95th percentile Netherlands male (HR-4-2). This data was revised to include spine straightening and also compared with the method using erect sitting height (HR-4-16). It showed that making use of automotive sitting height a 95th percentile Netherlands male needs a height of 826 mm and making use of erect sitting height a 95th percentile Netherlands male needs 849 mm. The justification cited for using the method of automotive sitting height is that this measurement calculation incorporates the effect of backset and it measures occupants as they sit in a vehicle.

21. The Netherlands data appears to be more robust because it measures erect sitting height and does not need to take in account spine straightening. Some representatives questioned the necessity of taking into account spine straightening. It was suggested that spine straightening might not be a factor when there is a reduced backset. Additionally, it was suggested that the spine straightening research of Kroonenberg, which showed a T1 z-displacement of 34 mm (SAE paper 983158), was conducted on a standard (cushioned) car seat, and a similar research of Ono (which showed similar effects) was conducted on a rigid board. It was discussed that this phenomenon would not be as pronounced in a cushioned automotive seat.

22. One representative suggested that their head restraints were built with a compliance margin of 20 mm; therefore their head restraints were being built to 820 mm. If the height of the head restraint were required to be 850 mm, this representative would need to build their head restraints to 870 mm. This statement was countered by another representative who noted that some vehicles in the fleet only had heights between 800 mm and 820 mm. It was noted that with an 800 mm head restraint, it becomes a challenge to install seats in the vehicle, and a larger head restraint can also restrict occupant visibility (blocking vision rearward and to the side) (HR-3-5). Additional data was presented (HR-3-4) that showed that in small cars, 850 mm head restraints could severely restrict rearward vision in the rear-view mirror.

23. The Netherlands stated that taller men were also accounted for in the statistics and that whiplash was a real problem in the Netherlands (fifty per cent insurance payments are to whiplash, there are problems with hospitals, etc.). In Japan, females have a higher potential of whiplash injury (HR-4-10). At the October 2007 meeting of the informal group, the EEVC also provided an EEVC Cost Benefit Analysis (UK Cost Benefit Analysis : Enhanced Geometric Requirements for Vehicle Head Restraints, EEVC, September 2007, http://www.eevc.org) demonstrating benefits for increasing head restraint height above 800 mm. At that meeting, the United States of America expressed concerns that there was insufficient time to fully evaluate these documents before the December 2007 session of GRSP, at which the gtr was to be finalized.

24. There are concerns that the method in which the height is measured may not reflect the effective height that would be needed to address the safety concerns of taller occupants. Some proposals put forward to improve the measurement method, but they were not yet fully developed for inclusion in the gtr (HR-10-2).

25. To resolve this issue, the informal group sought guidance from AC.3. AC.3 provided instruction through WP.29-143-23 rev 1 to state that the height requirement for the gtr would be 800 mm, and that the discussion on increasing the height requirement to 850 mm and/or revising the measurement method should be continued in Phase 2 to this gtr.

2. Rear outboard

26. It was proposed that optionally installed rear outboard head restraints should have a minimum height of 750 m. Additionally, it was proposed to define a rear head restraint as any seat structure with a minimum height of 700 mm. The current practice in UNECE is to allow the manufacturer to determine what is and is not a head restraint. The United States standard requires that optionally

installed rear outboard head restraints should meet the requirements of the standard. The recommendation of the group is that these head restraints, if installed, must conform to the dimensional requirements, with a 750 mm height, and static requirements, excluding backset.

3. Front centre/rear centre

27. There was discussion on how front centre head restraints were regulated under UNECE Regulation No. 17 and how to address these restraints in the gtr. The manufacturer has the option whether or not to approve centre head restraints to the requirements; i.e. the installation of a centre head restraint has not necessarily been approved to the requirements. In the United States of America, if a manufacturer chooses to optionally install a piece of equipment, that piece of equipment must meet the regulation. For example, manufacturers have the option to install rear outboard head restraints, but if they are installed, they must meet the requirements outlined in FMVSS No. 202.

28. Some experts were concerned with the ability to justify regulating front centre head restraints due to low occupancy rates. There were also concerns that front centre head restraints may impede visibility. It was stated that in Europe there was a UNECE requirement that limits obscurity of rearward visibility to 15 per cent.

29. GRSP recommends that front centre head restraints be included in the gtr and regulated in the same manner as rear outboard head restraints (i.e. optional, no backset requirement, 750 mm height, etc.). Requirements for rear centre head restraints have also been included. These head restraints have the same requirements as front centre head restraints, but they do not have a height requirement. However, as defined in the gtr, to be called a head restraint, it must have a minimum height of 700 mm.

B. Seat set up and measuring procedure for static measurements

30. The method of measuring static measurements was discussed. Some recommended taking all measurements from the R-point. Another proposal is to use the J826 manikin as the primary measurement tool. The use of the R-point allows measurements to be verified to known design points on the vehicle thus improving repeatability. The use of the J826 manikin allows the seat H-point to be measured as it exists in the vehicle and when it is under load. It was argued that options in seat materials and manikin set up can produce recordable differences from one seat to another. UNECE experience shows that the use of the R-point allows measurements to be easily verified on a drawing and is also very repeatable and reproducible when verified in a car. The use of H-point can address differences in measurements caused by seat materials and manufacturing variability.

31. GRSP had difficulty coming to consensus on this issue and sought guidance from AC.3. AC.3, per document WP29-143-23/Rev.1, instructed that all static measurements, except for backset, will use the R-point as the required reference point and that backset should be taken with the H-point as the required reference point, although some Contracting Parties may choose to allow backset to be measured with R-point as the required reference.

VI. LIST OF INFORMAL GROUP DOCUMENTS

HR-1-1	Attendance List, Paris, 1-2 February 2005
HR-1-2	(USA) Final Rule
HR-1-3	(USA) Final Regulatory Impact Analysis - FMVSS No. 202 Head Restraints for Passenger Vehicles
HR-1-4	(USA) Comparison of Head Restraint Regulations FMVSS 202 (Current standard, Final Rule, and UNECE Regulation No. 17)
HR-1-5	{Blank}
HR-1-6	Head Restraints for Rear Seating Positions
HR-1-7	(OICA) Abstract from ACEA Whiplash Test Series on Repeatability and Reproducibility of Proposed Test Procedures
HR-1-8	(USA) United States FMVSS No. 202 Final Rule
HR-1-9	GRSP informal group on head restraints 1st Meeting, Paris, 1-2 February 2005 Draft Summary Report
HR-1-9-Rev.1	GRSP informal group on head restraints 1st Meeting, Paris, 1-2 February 2005 Draft Summary Report
HR-2-1	(USA) The Displacement Test as an Alternative to the 60 mm Gap Requirement
HR-2-2	Head Restraint Informal Working Group Meeting - Agenda 11-13 April 2005, OICA Offices, Paris, France
HR-2-3	(Netherlands) Static geometric measurements on head restraints
HR-2-4	(USA) Justification for 254 mm width of Head Restraints on Bench Seats
HR-2-5	(Japan) Japan's Comments on Backset Requirements of FMVSS 202aS – Final Rule - Study of Variations in Backset Measurements
HR-2-6	(USA) Head Restraint Height Measurement - H-point vs. R-point
HR-2-7	(USA) Correlation of Dynamic Test - Procedure to Field Performance
HR-2-8	(USA) Justification for Load Values - FMVSS No. 202 Final Rule – Backset and Height Retention Testing
HR-2-9	BioRID ATD - Part of a Presentation from Matthew Avery / Thatcham for an EEVC WG12/20 joint meeting
HR-2-10	Neck Injuries - Real World Data - Male/Female Comparison - Raimondo Sferco / Bernd Lorenz - Ford Motor Company/BASt
HR-2-11	(Germany) Current Status of the Euro NCAP Whiplash Subgroup Bundesanstalt für Straßenwesen - Federal Highway Research Institute
HR-2-12	(Germany) Current Status of the EEVC WG 20 "Rear Impact test procedure(s) and the mitigation of neck injury" Bundesanstalt für Straßenwesen - Federal Highway Research Institute
HR-2-13	(OICA) Comment for Non Use Position of Non Use Position of Head Restraint gtr
HR-2-14	(Netherlands) Needed Height for Head Restraints
HR-2-15	Attendance List - GRSP Informal Group Meeting on Head Restraints Paris, 11-13 April 2005
HR-3-1	Head Restraint Informal Working Group Meeting - Agenda, 13-15 June 2005, NHTSA Office, Washington, D.C., USA
HR-3-2	Japan's Comments on Draft Action Items for June 2005 - Head Restraints gtr Meeting
HR-3-3	Japan's Comments on Backset Requirements of FMVSS 202aS - Final Rule

HR-3-4	Japan's Comments on Head Restraint Height Proposal from the Netherlands
HR-3-5	Height of Head Restraint - Impact of increased height threshold of head restraints
HR-3-6	(Netherlands) Calculation needed head restraint height
HR-3-7	(Japan) Biomechanical Responses of HY-III and BioRID II (Part 1)
HR-3-8	(Japan) Biomechanical Responses of HY-III and BioRID II (Part 2)
HR-3-9	(USA) Laboratory Test Procedure for FMVSS 202aS - Head Restraints – Static Requirements
HR-3-10	(OICA) Alliance of Automobile Manufacturers - Head Restraint gtr Input
HR-3-11	Attendance List - GRSP Informal Group Meeting on Head Restraint – Washington, D.C., 13-15 June 2005
HR-3-12	(USA) Final Rule
HR-3-13	(USA) Final Regulatory Evaluation: Extension of Head Restraint Requirements to Light Trucks, Buses, and Multipurpose Passenger Vehicles with Gross Vehicle Weight Rating of 10.000 pounds or Less (FMVSS 202)
HR-3-14	(USA) An Evaluation of Head Restraints Federal Motor Vehicle Safety Standard 202, February 1982
HR-4-1	Agenda of the Head Restraint Informal Working Group Meeting – 7-9 September 2005, OICA Office, Paris, France
HR-4-2	(USA) United States' analysis of the need to raise the head restraint height to 850 mm
HR-4-3	(Japan) Japanese Backset Raw Data Revision B
HR-4-4	(USA) Extending the Applicability of United States FMVSS 202 to Light Trucks and Vans - Summary of HR-3-12 and HR-3-13
HR-4-5	(USA) United States Justification for "Other Collisions" in the Proposed Scope
HR-4-6	Draft Global Technical Regulation on Head Restraints
HR-4-7	(CLEPA) Head Positions, Summary of UMTRI Study and Vehicle Examples
HR-4-8	(CLEPA) Comparison between the Pendulum and the Free Motion Headform (FMH) energy dissipation test
HR-4-9	(Japan) Japan's Comments on Backset Requirements of FMVSS 202aS – Final Rule
HR-4-10	(Japan) Japan Accident Analyses for Application and Height on Head Restraints gtr
HR-4-11	(Japan) Japan Research Status for Bio-RID II Injury Parameters on Head Restraints gtr
HR-4-12	(Japan) Japan Research Status for Bio-RID II Dummy Repeatability and Reproducibility on Head Restraints gtr
HR-4-13	(OICA) Head Restraint gtr Informal Working Group - OICA Data Submission, 7-9 September 2005
HR-4-14	(UK) UK Population Stature 1993-2003
HR-4-15	(OICA) Draft Proposal on Roof Clearance for Tip Forward Seat Backs
HR-4-16	(Netherlands) Netherlands' Comparison of Two Different Calculations of "Needed Head Restraint Height".
HR-4-17	HR-4-6 (202 Draft gtr) revised as of 9 September 2005 (HR-4-17)
HR-4-18	(OICA) Head Restraint Definition
HR-5-1	Meeting Agenda
HR-5-2	Draft GTR regulatory text
HR-5-3	(OICA) Non-Use Position proposal
HR-5-4	US Measurement Variability Presentation
HR-5-5	US Non-Use Position Study

HR-5-6	US Energy Absorption Test
HR-5-7	(OICA) Head Restraint Height Clearance
HR-5-8	(UK) Rear Impact Dummy Research
HR-5-9	(OICA) Backset Complaint Data
HR-5-10	US Measurement Variability Comparison
HR-5-11	(OICA) Dummy Performance Comparison
HR-5-12	(CLEPA) Dynamic tests with control yielding seats
HR-5-13	(OICA) Head Restraint Applicability data
HR-5-14	(Canada) Head Restraint Comparison Methods
HR-5-15	Status of Euro NCAP
HR-5-16	ESV Paper: The Role of Seatback and Head Restraint Design Parameters on Rear Impact Occupant Dynamics
HR-5-17	US Energy Absorption Test report
HR-5-18	(Japan) Presentation on Accident Data
HR-5-19	(Japan) Presentation on Reproducibility of Dummy Data
HR-5-20	Meeting Minutes – January 2006
HR-5-21	Gtr regulatory text at end of meeting 1/27/06
HR-5-22	Draft gtr regulatory text for Height Retention of Head Restraints
HR-5-23	US Head Restraint Non-Use Position Report
HR-6-1	Meeting Agenda
HR-6-2	Draft gtr regulatory text - April 14, 2006
HR-6-3	(OICA) Test procedure for backset measurement from R-point
HR-6-4	Draft gtr regulatory text - April 21, 2006
HR-6-5	(Japan) Hybrid III T1G for whiplash evaluation in a dynamic test
HR-6-6	(OICA) Dimensional drawings for document HR-6-3
HR-6-7	(France) Consideration for measuring active head restraints
HR-6-8	(CLEPA) Test Procedures for Energy Dissipation Test
HR-6-9	(CLEPA) Foam Influence on height retention
HR-6-10	(Japan) Example of Gap greater than 60 mm
HR-6-11	(UK) Head Restraint Height Calculations
HR-7-1	Agenda for 7th Head Restraint Informal Meeting
HR-7-2	Head Restraint gtr regulatory text –Sept 12, 2006
HR-7-3	Head Restraint gtr regulatory text - Sept 14, 2006
HR-7-4	Alliance/OICA Head Restraint Backset Measurement Study
HR-7-5	Canada – Measuring Backset with HRMD
HR-7-6	The Current Status of Head Restraint Regulation in Korea
HR-7-7	(Japan) Comment to the New French Dynamic Backset Proposal
HR-7-8	OICA - Trigger point in dynamic test procedure
HR-7-9	(Japan) Comment for Height on Head Restraint gtr
HR-7-10	(Japan) Comment for New Backset Measurement Procedure
HR-7-11	US Height & Backset Benefits
HR-7-12	US Benefits calculation – H-point vs R-point
HR-8-1	Agenda Meeting - December 2006
HR-8-2	Gtr regulatory text
HR-8-3	Technical rational for gtr
HR-8-4	US Dynamic Testing of Active Head Restraints

HR-8-5	Revised gtr regulatory text - US and Canada comments
HR-8-6	Gtr regulatory text Biorid - France
HR-8-7	Annex 8_Biorid spec - France
HR-8-9	Biorid_Fx
HR-8-10	OICA_PC-HR Test Method
HR-8-11	Alliance-NHTSA HR presentation –FINAL
HR-8-12	NL RDW Comparison of Methods
GRSP-41-3	(Japan) Head Restraint gtr - Backset Test Programme
GRSP-41-4	(Japan) Proposal to set up the head restraints gtr phase
GRSP-41-12	(USA) Head restraint gtr
GRSP-41-21	(OICA) Customer study - shingled head restraints
GRSP-41-20	(USA) Head restraint draft gtr
GRSP-41-22	(USA) Head restraint gtr - Backset limit
GRSP-41-23	(OICA) Gtr on head restraints: Backset measuring method - Analyses of H-point and R-point method
GRSP-41-26	(USA) Proposal for draft amendments to draft global technical regulation (gtr) on head restraints
GRSP-41-27	(OICA) Gtr on head restraints: Triggering of active systems in sled test
GRSP-41-34	(USA) Fifth progress report of the informal group on head restraints
GRSP-41-35	(OICA) OICA test programme on backset measurement
HR-10-1	(GRSP-chairperson) Revised version of the draft gtr after GRSP 41st sesssion
HR-10-2	(NL) Proposal for draft amendments to draft gtr on head restraints
HR-10-3	(USA) Justification to Apply the Head Restraint GTR to Category 2 Vehicles with a GVM $\leq$ 4,500 kg
HR-10-4	(Japan) Proposal for Head Restraint gtr Phase 1 Dynamic Option for BioRID II
HR-10-5	(EEVC) EEVC WG20 Recommendations for a Low-speed Rear Impact Sled Test Pulse
HR-10-6	(UK) WG20 Static Geometric UK Cost-Benefit
HR-10-7	(UK) Dynamic Geometric Options
HR-10-8	(UK) EEVC WG12-20 Hybrid III Biofidelity Review
HR-10-11	(GRSP-chairperson) Revised version of HR-10-1
HR-10-9	(EEVC) EEVC WG12 Rear Impact Biofidelity Evaluation Programme
HR-10-10	(NL) The minimum Front Contact Surface Head Restraint

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Note: All the documents of the informal group on head restraints are available at: http://www.unece.org/trans/main/welcwp29.htm . All documents and comments related to the U.S.A. rulemaking on head restraints can be found by searching for dockets NHTSA-2000-8570, NHTSA-2004-19807, and NHTSA-2007-27986 at http://www.regulations.gov .

Appendix 1

Comparison of head restraint regulations UNECE Regulation No. 17 / FMVSS No. 202
(Current U.S.A: standard, U.S.A. final rule, and UNECE Regulation No. 17)

Head Restraint Component	US – FMVSS No. 202 (current)	US - FMVSS No.202 Final Rule (HR-1-2)	UNECE Regulation No 17	Comments
A. Application 1. Vehicles				
	Front outboard seating positions in passenger cars, MPVs and trucks with a GVWR ≤ 4,536 kg	Front outboard and rear outboard (optional) seating positions in passenger cars, MPVs and trucks with a GVWR ≤ 4,536 kg, with added exclusion for seating position adjacent to aisle on buses (more than 10 seats)	Front outboard and rear (optional) seating positions in vehicles of categories M_1 and N_1, and of vehicles of categories M_2 up to 3,500 kg (paras. 5.3.1. to 5.3.2)	-If head restraints (HR) present in rear seat, UNECE Regulation No. 17 and 202 Final Rule regulates. -UNECE Regulation No. 17 regulates rear center head restraints if available.
2. Requirements				
a. Height				
1. Front outboard				
A. Fixed	At least 700 mm above H-point as measured parallel to the torso reference line.	Increased to 800 mm above H-point and measured with a SAE J826 manikin. Seat back angle set at 25 degrees. Seat cushion at highest position.	Same height as FR, but measured from R-point. Seat back angle is 25 degrees or manufacturer specified. Seat cushion at lowest position	Different seat set-up and measuring techniques used.
B. Adjustable	Same as 202-fixed	Must achieve a height of 800 mm and cannot be adjusted below 750 mm. Measured with a SAE J826 manikin. Seat back angle set at 25 degrees. Seat cushion in highest position.	Same height as FR, but measured from R-point and at manufacturer's suggested angle or 25 degrees. Seat cushion in highest position.	Different seat set-up and measuring techniques used.

Head Restraint Component	US – FMVSS 202 (current)	US - FMVSS 202 Final Rule (HR-1-2)	UNECE Regulation No. 17	Comments
a. Height (cont.) 2. Rear outboard	(202 Final Rule: Rear head restraint means a rear seat back, or any independently adjustable seat component attached to or adjacent to a seat back, that has a height equal or greater than 700 mm, in any position of backset and height adjustment.)			
A. Fixed	Not specified	If provided, minimum height of 750 mm above H-point. Measured with SAE J826 Manikin.	If provided, same height as FR, but measured from R-Point	Different seat set-up and measuring techniques used.
B. Adjustable	Not specified	If provided, no adjustment below 750 mm from H-point. Measured with SAE J826 Manikin.	If provided, same as FR, but measured from R-Point	Different seat set-up and measuring techniques used.
3. Rear Center				
	Not specified	Not specified	If provided, minimum height of 700 mm above R-point	
b. Backset				
1. Front outboard positions	Not specified	Backset limited to a maximum 55 mm as measured with HRMD. Head restraint in at any height adjustment between 750 and 800 mm, inclusive. Seat back angle set at 25 degrees. Seat cushion at highest position.	No backset specified, but there is a general requirement for the seat back angle to be set at manufacturer's suggested angle or 25 degrees and the seat cushion to be in the lowest position.	Different seat set-up and measuring techniques used.

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c. Width				
1. Front outboard	Minimum of 171 mm on single seats and 254 mm on bench seats	Minimum of 170 mm on single seats (outboard seats with no seat in between) and 254 mm on bench seats (outboard seats with seat in between).	Minimum of 170 mm for all seat types.	United States requires wider HRs on front outboard seats with a center seat between them.
2. Rear outboard	Not specified	If provided, minimum of 170 mm for all seat types	If provided, minimum of 170 mm.	
d. Height of adjustable head restraint front surface				
	Not specified	Not specified	Minimum height of 100 mm	
e. Gaps				
1. All outboard positions	Not specified	In all positions, gap between HR and seat back and within the HR is ≤ 60 mm. A 165 mm sphere is pressed against the gap with a load no more than 5 N	-In lowest position, gap is ≤ 25, with no reference to backset adjustment. Measured along straight line between HR and seat back. -In other positions the gap ≤ 60 mm as measured with 165 mm dia. sphere. -Gaps larger than 60 mm are allowed if they pass the energy absorption test.	-UNECE Regulation Nos. 17 and 25 does not specify load placed on the sphere to measure gap. UNECE Regulation Nos. 17 and 25 measures the gap between the HR in the lowest position and seat back differently from the gaps in the HR. -Larger gaps allowed by UNECE, but must be tested.

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f. HR Adjustment Retention Devices (locks)				
1. Height	Not specified	Must maintain height in highest position and at 800 mm and 750 mm for front and rear seats (if HR provided), respectively, while a downward force is applied. Seat back is rigidly constrained.	If adjustable, requires automatic locking system (UNECE Regulation No. 17, para. 5.1.1). No downward test required.	UNECE has no downward testing requirement.
2. Backset	Not specified	Under applied rearward moment, while adjusted to 800 mm for front and 750 mm for rear (if provided), HR must maintain any position of backset adjustment. Seat back is rigidly constrained.	Not specified.	
g. Removability				
1. Front	Not specified	Can be removed with deliberate action distinct from any act necessary for adjustment.	Same as 202 FR	
2. Rear	Not specified	Can be removed with deliberate action distinct from any act necessary for adjustment.	Same as 202 FR	

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h. Clearance				
	Not specified	25 mm clear space allowed where rear HRs, when seat is occupied, interfere with roofline or rear window.	If HR provided, 25 mm clear space allowed where interference with vehicle structure. Seat does not need to be occupied. Minimum height of 700 mm must be maintained.	-In UNECE the 25 mm gap is measured from any vehicle structure, not just roofline or rear window as in FR. -UNECE requires a minimum seat height if HR is present. FR defines a rear HR as having a height greater than 700 mm
i. Non-use positions				
1. Front	Not specified	Not allowed	Allowed, provided HR automatically returns to proper position when seat is occupied.	
2. Rear	Not specified	Allowed, provided HR automatically returns to proper position when seat is occupied or the HR is rotated a minimum of 60° forward or rearward.	Allowed as long as non-use position is "clearly recognizable to the occupant".	United States rule defines "clearly recognizable" as being rotated forward or rearward 60°.
j. Radius of Curvature				
	Not specified	In NPRM, requirement was same as UNECE Regulation No. 17. Requirement was deleted in final rule.	Parts of front and rear of HR shall not exhibit a radius of curvature less than 5 mm.	Deleted in FR because enforcement outweighs benefits. No commenter had info to support reg.

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k. Energy Absorption				
	Not specified	Front of HR impacted with head form at v=24.1 km/h. 3 ms deceleration of head form must not exceed 80 gs. Impactor is linear head form with mass of 6.8 kg.	Similar to FR: Uses pendulum impactor with same weight and velocity as linear impactor. Front and rear of HR tested.	Tests in UNECE and FR are functionally equivalent. Except FR does not test rear of HR.
l. Displacement Test Procedures				
	Load is applied to back pan of seat, load is applied to head restraint after seat load is removed. 102 mm of displacement allowed with 373 Nm moment. Load is increased until 890N or seat back fails. Use spherical or cylindrical form to apply load.	Test procedure modified from 202. Seat back and HR loaded together. Moments and displacements same. Maximum load the same, seat back cannot fail. Use spherical form to apply load	Same load and displacement requirements as FR.	FR provides a detailed test procedure, including load hold times.
m. Dynamic sled test (optional)				
	Seat accelerated so the pulse falls in a corridor defined by 2-½ sine waves with amplitudes of 78 m/s^2 and 86 m/s^2. Corridor cannot be met. 95th male dummy used, max rotation 45°.	New corridor based on scaled version 208 sled test. Target pulse the same as 202. 50th male dummy used in any seat, HR adjusted midway between lowest and highest position and any backset position. 12° max rotation.	Not specified	
