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CONSIDERATION AND VOTE BY AC.3 OF DRAFT GLOBAL TECHNICAL REGULATIONS AND/OR DRAFT AMENDMENTS TO ESTABLISHED GLOBAL TECHNICAL REGULATIONS

Proposal for a draft global technical regulation on pedestrian safety

Final report on the development of the global technical regulation concerning pedestrian safety

Transmitted by the Working Party on Passive Safety (GRSP)

The text reproduced below was adopted by GRSP at its forty-first session. It is based on ECE/TRANS/WP.29/GRSP/41/Add.1. It is submitted to WP.29 and AC.3 for consideration and vote (ECE/TRANS/WP.29/GRSP/41, para. 10).

I. INTRODUCTION

1. During the one-hundred-and-twenty-sixth session of the World Forum for Harmonization of Vehicle Regulation (WP.29) in March 2002, AC.3 concluded their considerations of priorities for developing future global technical regulations. WP.29 adopted the 1998 Global Agreement Programme of Work, which included pedestrian safety, and decided to start the work on pedestrian safety at the thirty-first session of the Working Group on Passive Safety (GRSP) in May 2002, by creating an informal group to draft the global technical regulation (gtr). The formal proposal to develop a gtr (TRANS/WP.29/AC.3/7) was considered and adopted by the AC.3 at its tenth session, in March 2004. It is based on document TRANS/WP.29/2004/26, which had been submitted by the European Community, the technical sponsor of the project.

2. Informal document No. 10 of the thirty-first session of GRSP lays down the terms of reference of the group and the document was adopted by GRSP (INF GR/PS/2 – See the appendix).

II. EVALUATION OF THE SAFETY PROBLEM

A. Numbers of fatalities and injuries to be considered

3. Each year, thousands of pedestrians and cyclists are struck by motor vehicles. Most of these accidents take place in urban areas where serious or fatal injuries can be sustained at relatively low speed, particularly in the case of children.

4. Data sourced from Australia, Japan, the United States of America, the International Harmonized Research Activities (IHRA) 1/, Germany 2/, Italy 3/, the UNECE 4/, Spain 5/, Canada 6/, the Netherlands 7/, Sweden 8/, and Korea 9/ indicate that, annually: in the European Union about 8,000 pedestrians and cyclists are killed and about 300,000 injured; in North America approximately 5,000 pedestrians are killed and 85,000 injured; in Japan approximately 3,300 pedestrians and cyclists are killed and 27,000 seriously injured; and in Korea around 3,600 pedestrians are killed and 90,000 injured.

1/ A list of reference documents is listed in the appendix to this report. The documents are available on the UNECE WP.29 website http://www.unece.org/trans/main/welcwp29.htm. IHRA data are set forth in working paper No. 3 of the informal group on pedestrian safety (INF GR/PS/3) http://www.unece.org/trans/doc/2002/wp29grsp/inf-gr-ps-3e.ppt, first meeting of the Informal Group on Pedestrian Safety, and in working paper No. 31 (INF GR/PS/31).
2/ INF GR/PS/12, 13 and 25
3/ INF GR/PS/14
4/ INF GR/PS/15
5/ INF GR/PS/16
6/ INF GR/PS/20
7/ INF GR/PS/21
8/ INF GR/PS/41
9/ INF GR/PS/70

B. Distribution of the injuries

5. Comparing the ages of those involved, statistics have shown that the highest frequency of accidents is for children of 5 to 9 years old, and for adults over 60 years old. Children (aged 15 and under) account for nearly one-third of all injuries, even though they constitute only as much as 18 per cent of the population.

6. The frequency of fatal and serious injuries (Abbreviated Injury Scale AIS 2-6), with respect to body regions, has been found to be highest for the child and adult heads and the adult leg.

7. Each of these body regions covers more than 30 per cent of total accidents. The proposed global technical regulation (gtr) focuses on protecting these body regions.

8. The major source of child head injuries is the top surface of the bonnet/wing, while adult head injuries result from impacts to the top surface of bonnet/wing and windscreen area. For adult leg injuries, the major source is the front bumper of vehicles.

C. Impact speeds

9. Crash speeds between vehicles and pedestrians were collected from pedestrian accident data and the cumulative frequency of the crash speeds has indicated that a crash speed of up to 40 km/h would cover more than 75 per cent of total pedestrian injuries. Thus, if a closing speed of up to 40 km/h is considered, it will significantly reduce the levels of injury sustained by pedestrians involved in frontal impacts with motor vehicles.

D. Target population for the gtr

10. The injury data indicates the injury distribution by body regions. It was found that, at 40 km/h or less, pedestrian-vehicle impacts accounted for 58 percent of child head-to-bonnet contacts, 40 percent of adult head-to-bonnet contacts, 19 percent of adult head-to-windshield contacts and 50 percent of adult leg-to-bumper contacts. Furthermore, bonnet impacts account for 41 percent of child head injuries and 19 percent of adult head injuries; windshield impacts represent 49 percent of adult head injuries; and bumper impacts account for 64 percent of adult leg injuries. Based on these distributions of injuries by injury source and vehicle contact area, the target population for the proposed gtr is 24 percent of all child pedestrian head injuries, 17 percent of all adult pedestrian head injuries, and 32 percent of adult leg injuries.

E. Motor vehicle categories considered

11. The maximum benefit from making vehicles pedestrian friendly would occur if all types of vehicles comply with these technical provisions, but it is recognised that their application to heavier vehicles (large trucks and buses) could be of limited value and may not be technically appropriate in their present form. For this reason, the scope of application is limited to passenger vehicles, light commercial vehicles and other light trucks. Since these vehicle categories represent the vast majority of vehicles currently in use, the proposed measures will have the widest practicable effect in reducing pedestrian injuries.

III. DESCRIPTION OF THE PROPOSED REGULATION

12. When an adult pedestrian is struck by a vehicle, the first impact is generally between the pedestrian knee region and the vehicle's front bumper. Because this initial contact is below the pedestrian's center of gravity, the upper body begins to rotate toward the vehicle. The pedestrian's body accelerates linearly relative to the ground because the pedestrian is being carried along by the vehicle. The second contact is between the upper part of the grille or front edge of the bonnet and the pedestrian's pelvic area. The pedestrian's legs and pelvis have reached the linear velocity of the vehicle at this point and the upper body (head and thorax) are still rotating toward the vehicle. The final phase of the collision involves the head and thorax striking the vehicle with a linear velocity approaching that of the initial striking velocity of the vehicle. Research has shown that the linear head impact velocity is about 90 percent of the initial contact velocity.

13. Through the analysis of pedestrian accidents, it has been concluded that child and adult heads and adult legs are the body regions most affected by contact with the front end of vehicles. On vehicles, the bonnet top, the windscreen and the A-pillars are the vehicle regions mostly identified with a high potential for contact. According to an International Harmonized Research Activities Pedestrian Safety (IHRA/PS) working group study, the above-mentioned areas can cover more than 65 per cent of the fatal and serious injuries.

14. Based on these study results, the informal group prioritised the development of approaches to simulate pedestrian impact and encourage countermeasures that will improve pedestrian protection. This gtr would improve pedestrian safety by requiring vehicle bonnets and bumpers to absorb energy more efficiently when impacted in a 40 kilometer per hour (km/h) vehicle-to-pedestrian impact, which accounts for more than 75 per cent of the pedestrian injured accidents reported by IHRA/PS.

15. The gtr consists of two sets of performance criteria applying to: (a) the bonnet top and (b) the front bumper. Test procedures have been developed for each region using sub-system impacts for adult and child head protection and adult leg protection. 10/

16. The head impact requirements will ensure that bonnet tops will provide sufficient head protection when struck by a pedestrian. The bonnet top would be impacted with a child headform and an adult headform at 35 kilometers per hour (km/h). The head performance criterion (HPC) 11/ must not exceed 1,000 over 1/2 of the child headform test area and must not exceed 1,000 over 2/3 of the combined child and adult headform test areas. The HPC for the remaining areas must not exceed 1,700 for both headforms.

17. The leg protection requirements for the front bumper would require bumpers to subject pedestrians to lower impact forces. This gtr specifies that the vehicle bumper is struck at 40 km/h with a legform that simulates the impact response of an adult's leg. Vehicles with a lower bumper

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10/ To develop these test procedures, the group carefully studied the availability of a pedestrian dummy as a method for the test procedures. However, there is presently no test dummy which could be considered suitable for regulatory use and so subsystem test methods are proposed which are readily available, and which have the necessary reliability, repeatability and simplicity.

11/ HPC is calculated in the same manner as the Head Injury Criterion (HIC).

height of less than 425 millimeters (mm) are tested with a lower legform developed by the Transport Research Laboratory (TRL), while vehicles with a lower bumper height of more than 500 mm are tested with an upper legform. Vehicles with a lower bumper height which is between 425 mm and 500 mm are tested with either legform as chosen by the manufacturer. In the lower legform to bumper test, vehicles must meet limits on lateral knee bending angle, knee shearing displacement, and lateral tibia acceleration. In the upper legform to bumper test, limits are placed on the instantaneous sum of the impact forces with respect to time and on the bending moment imposed on the test instrument.

IV. PROCEDURAL BACKGROUND

A. Documents and reports

18. All documents referred to as INF GR/PS/… working papers may be found on the UNECE website at <http://www.unece.org/trans/main/wp29/wp29wgs/wp29grsp/pedestrian_10.html>.

19. Informal document No. 7 of the thirty-second session of GRSP reported on the result of the first meeting of the informal group (INF GR/PS/9).

20. Informal document No. 2 of the thirty-third session of GRSP (INF GR/PS/47 Rev1) was the first preliminary report of the informal group and responds to paragraph 5 of documents TRANS/WP.29/2002/24 and TRANS/WP.29/2002/49 as adopted by AC.3 and endorsed during the one-hundred-and-twenty-seventh session of WP.29. The documents were consolidated in the final document TRANS/WP.29/882. The preliminary report was adopted as TRANS/WP.29/2003/99 by AC.3 in November 2003.

21. Informal document No. GRSP-34-2 of the thirty-fourth session of GRSP reported on the action plan of the informal group (INF GR/PS/62).

22. Informal document No. GRSP-35-4 of the thirty-fifth session of GRSP was the second preliminary report of the informal group (INF GR/PS/86 Rev2 and PS/88). This report was considered by AC.3 in June 2004 as informal document No. WP.29-133-7.

23. Informal document No GRSP-36-1 of the thirty-sixth session of GRSP was the first draft gtr of the informal group (INF GR/PS/116).

24. TRANS/WP.29/GRSP/2005/3 was proposed at the thirty-seventh session of GRSP and was a revised draft gtr including the preamble, of the informal group (INF GR/PS/117).

B. Meetings of the informal working group

The group held the following meetings:

(a) 4-5 September, 2002, Paris, France
(b) 10 December, 2002, Geneva, Switzerland
(c) 15-16 January, 2003, Santa Oliva, Spain
(d) 15-16 May, 2003, Tokyo, Japan

(e) 10-12 September, 2003, Ottawa, Canada
(f) 24-26 February, 2004, Paris, France
(g) 28-30 September, 2004, Paris, France
(h) 11-13 July, 2005, Brussels, Belgium
(i) 5-6 December, 2005, Geneva, Switzerland
(j) 16-19 January, 2006, Washington DC, USA

25. These meetings were attended by representatives of:
Canada, the European Commision, France, Germany, Italy, Japan, Korea, the Netherlands, Spain, Turkey, the United States of America, International Organization of Motor Vehicle Manufacturers (OICA), European Association of Automotive Suppliers (CLEPA), Consumers International (CI) and European Enhanced Vehicle-safety Committee (EEVC).

26. The meetings were chaired by Mr. Mizuno (Japan) and Mr. Friedel/Mr. Cesari (EEVC), while the secretariat was provided by Mr. Van der Plas (OICA).

V. EXISTING REGULATIONS, DIRECTIVES, AND INTERNATIONAL VOLUNTARY STANDARDS

27. At the present time, there are no regulations concerning the provision of improved protection for pedestrians and other vulnerable road users in the Compendium of Candidates.

28. The following is a summary of national and regional legislation and of work in international fora:

29. The Japanese Government has established a regulation on pedestrian protection. The regulation addresses the issues of providing protection for the child and adult heads. It applies to passenger cars with up to 10 seats and to small trucks of up to 2,500 kg gross vehicle weight with application from 2005 for new vehicle types and from 2010 for existing vehicle types (certain other vehicles have a timetable which is postponed by two years). The regulation requires compliance with test requirements using representative head impactors.

30. The European Parliament and Council adopted the Directive 2003/102/EC which provides for the introduction of requirements for leg injuries, upper leg injuries and adult and child head injuries. The Directive and its requirements are incorporated into Community legislation under the European Union whole vehicle type approval system set up by EU Framework Directive 70/156/EEC. It applies to passenger cars of category M_1 and to light commercial vehicles derived from passenger cars of M_1 category, both up to 2,500 kg gross vehicle weight, with application dates in two phases starting in 2005 and 2010. The requirements and the tests are based on the research results that were published by EEVC in the 1990's and that were introduced in a less severe form for the first phase and in the originally proposed form for the second phase. However, since EEVC results have never been fully accepted by all involved parties, the Directive provided for a review of the feasibility of the requirements of the second phase in 2004. This feasibility review has taken place and will result in amendments to the European requirements in its second phase, starting in 2010.

31. Canada is currently reviewing their bumper regulation. The Canadian bumper regulation is one of the most stringent in the world (all the safety features of the vehicle have to be functional after an 8 km/h impact). In addition, Canada is investigating the effect of bumper design on different leg test devices (Transport Research Laboratory (TRL) legform impactor; Polar dummy and flexible pedestrian legform impactor (Flex-PLI)).

32. The United States of America has had pedestrian protection programmes for pedestrian leg and pedestrian head and upper body impacts. A rulemaking proposal for improved pedestrian leg protection was terminated in 1991 when potential countermeasures were not shown to be effective. The National Highway Traffic Safety Administration (NHTSA) focused research on pedestrian head protection, developing test procedures, similar to this gtr, for simulating pedestrian head impacts on vehicle surfaces. Research was also conducted to understand how vehicles could be modified to reduce the severity of head impacts. 12/ 13/ The current US pedestrian protection research programme supports the IHRA objectives. Current activities include (1) pedestrian field data analysis to develop test conditions, (2) evaluation of pedestrian head and leg test tools, (3) experimental impact testing of vehicle structures to assess aggressivity, (4) pedestrian case reconstructions using a combination of field data, computer simulation, and testing to better understand injury mechanisms, (5) computer model development using available biomechanical literature, and (6) completion of other IHRA Pedestrian Safety Working Group action items.

33. The IHRA has developed test procedures for head protection and possible leg protection requirements. The informal group has recognized a need for research and development of recommendations on an improved tool and test procedure for the upper legform to high bumper vehicle test. Additionally, the informal group would request further research on the upper legform impactor to bonnet leading edge test.

34. The International Organisation for Standardisation (ISO) created the pedestrian protection working group (ISO/TC22/SC10/WG2) in 1987 to develop test methods for the reduction of serious injuries and fatalities for pedestrian to car accidents. The mandate for ISO/WG2 was to produce test methods, covering crash speeds up to 40 km/h, which will contribute to make cars pedestrian friendly. Since then, the WG2 has developed pedestrian test procedures and has described the necessary test tools. The study results were fully used by the IHRA/PS group, when the group developed the adult and child headform impactors.

12/ Saul, R.A., Edlefson, J.F., Jarrett, K.L., Marcus, J.R.; "Vehicle Interactions with Pedestrians," Accidental Injury: Biomechanics and Prevention, New York: Springer-Verlag, 2002.

13/ "Report to Congress: Pedestrian Injury Reduction Research," NHTSA Report DOT HS 808 026, June 1993.

35. The ISO standards and draft standards are:

(a) ISO 11096: 2002 Road vehicles—Pedestrian protection—Impact test method for pedestrian thigh, leg and knee,

(b) ISO/DIS 14513 2006 Road vehicles—Pedestrian protection—Head impact test method,

(c) [ISO/FDIS 16850] Road vehicles—Pedestrian protection—Child head impact test method.

36. The ISO group is now starting the development of a new adult leg test method and its test tool.

VI. OUTSTANDING ISSUES

37. There were issues raised by contracting parties with respect to three specific items in the proposed regulation, as follows:

(a) The United Kingdom noted that the mass of the child headform impactor specified in this draft gtr was different from that in the present European Union (EU) Pedestrian Protection Directive. The mass specified in the draft gtr is 3.5 kg, compared to 2.5 kg in Phase 2 of the present EU Directive. The United Kingdom has committed to vehicle construction measures that will achieve the level of reduction in pedestrian fatalities that the original Phase 2 of the Pedestrian Protection Directive (2003/102/EC) was anticipated to deliver and has, therefore, placed a reservation on the acceptance of a mass value of 3.5 kg, since it has not been clarified in what context these changes have been made with respect to any expected amendment to the existing EU legislation (ref: paragraph 6.3.2.1. of the proposal).

(b) The Netherlands noted that the headform velocity, specified for headform test impacts, was different from that in the present EU Pedestrian Protection Directive. The speed specified is 9.7 m/s compared to 11.1 m/s in the present EU Directive. The Netherlands has committed to vehicle construction measures that will achieve the level of reduction in pedestrian fatalities that the original Phase 2 of the Pedestrian Protection Directive (2003/102/EC) was anticipated to deliver, and has, therefore, placed a reservation on the headform test velocities, as it has not been clarified in what context these changes have been made with respect to any expected amendment to the existing EU legislation (ref: paragraphs 7.3.4. and 7.4.4. of the proposal).

(c) Under the subject of application there was acceptance for a consideration providing exemption with reference to vehicles of category 1-2 and category 2 which presented a flat front form of construction. It was agreed by the group that these vehicles could be problematic for the application of tests which have been developed with the more classic 'sedan type' vehicle shape and so, an exemption was introduced to cater for these concerns. However, in the final discussions some Contracting Parties (France and Italy) stated that this exemption should also apply to category 1-1. Otherwise they felt that there could be possible inconsistencies in requirements imposed on vehicles and a request was made to have these vehicles included under the exemption.

VII. GENERAL ISSUES

A. Applicability

38. The application of the requirements of this gtr refers, to the extent possible, to the revised vehicle classification and definitions outlined in the 1998 Global Agreement Special Resolution No. 1 concerning the common definitions of vehicle categories, masses and dimensions (S.R.1).

39. Difficulties, due to differing existing regulations and divergent vehicle fleets, were encountered in determining which vehicles would be included in the scope. The Japanese regulation applies to passenger cars for up to nine occupants and commercial vehicles up to a Gross Vehicle Mass (GVM) of 2,500 kg. The IHRA recommends tests and procedures for passenger vehicles of GVM 2,500 kg or less. The European Union (EU) Directive applies to M_1 vehicles up to 2,500 kg and N_1 vehicles up to 2,500 kg, which are derived from M_1. The ISO recommendations are for M_1 and N_1 vehicles that have a GVM of 3,500 kg or less. In addition, some countries, taking into account their current fleet composition, wanted to ensure that larger vehicles, such as light trucks and sport utility vehicles with a GVM of 4,500 kg or less, were not excluded.

40. The group originally reviewed in detail the IHRA recommendation to take into account the shape of the front of the vehicle, as an important parameter when discussing the types of pedestrian injuries to be mitigated. IHRA specifies three groups of vehicle shape: sedan, SUV, and 1-box. For the adult and child head impacts, IHRA foresees different impact test speeds and different impact angles. The Japanese legislation is based on the IHRA recommended method. The EU requirements, on the contrary, do not differentiate between the various test speeds and impact angles.

41. The group compared these various considerations and, on the basis of simulations (INF GR/PS/129), concluded that the EU requirements in effect are more severe than the Japanese proposals. For safety reasons, the group therefore uses the EU approach, not taking into account the shape of the vehicle front in defining the requirements. Furthermore, the group also determined that the IHRA recommendations would be difficult to put in place in the context of a regulatory and certification approach.

42. There was considerable discussion over the mass of vehicles to which this gtr should apply. Using the categories described in S.R.1, several options were examined. Some delegates wanted to limit application of the gtr to vehicles in category 1-1 with a vehicle mass of less than 2,500 kg GVM. Other delegates did not agree with a 2,500 kg limit on GVM, believing that since the front-end structure of vehicles with a mass up to 4,500 kg GVM is usually similar to that of lighter vehicles, the application of the gtr should include the heavier vehicles. In addition, some delegates sought to limit application of the gtr to vehicles of a GVM more than 500 kg, while other of delegates expressed concern about having a lower mass limit, believing that a particular jurisdiction might determine there is a need to apply the gtr requirements in that jurisdiction to vehicles with a GVM of less than 500 kg. There was a suggestion that the gtr should also apply to vehicles in category 2 that had the "same" general structure and shape forward of the A-pillars as vehicles in category 1-1. However, some were concerned that it would be unfeasible to define objectively what was meant by "same".

43. After considering these issues, it was recommended that the gtr should be drafted to have a wide application to vehicles, to maximize the ability of jurisdictions to effectively address regional differences in pedestrian accident crash characteristics. The gtr would establish that if a jurisdiction determines that its domestic regulatory scheme is such that full applicability is inappropriate, it may limit domestic regulation to certain vehicle categories or mass limits. The jurisdiction could also decide to phase-in the requirements for certain vehicles. A footnote was added to the gtr text to make it clear that jurisdictions can decide to limit the applicability of the regulation. This approach recognizes that niche vehicles that are unique to a jurisdiction would best be addressed by that jurisdiction, without affecting the ability or need for other jurisdictions to regulate the vehicles. When a Contracting Party proposes to adopt the gtr into its domestic regulations, it is expected that the Contracting Party will provide reasonable justification concerning the application of the standard.

44. While this approach maximizes the discretion of jurisdictions to decide whether vehicles should be excluded from the gtr for feasibility or practical reasons, or because there is no safety need to regulate the vehicles, the group also decided to recommend excluding one unique vehicle type from the regulation. The test procedures in the gtr are based largely on the classic vehicle shape with a long bonnet. Certain vehicles, generally cargo vehicles, have a very short bonnet and a front shape that is very close to the vertical. The pedestrian kinematics with these vehicles may be very different, and, in addition, there are difficulties in applying the tests to these vehicles, particularly with regard to determination of test zone reference lines. For these reason, the group recommends that those vehicles of category 1-2 and category 2, where the distance, measured longitudinally on a horizontal plane, between the transverse centre line of the front axle and the R-point of the driver's seat is less than 1,000 mm, be exempt from the requirements of the regulation. In addition, some of the group members raised a concern that this exemption could create inconsistancies in the market if category 1-1vehicles were not treated in a similar manner and thus, consideration should be given to the inclusion of this category of vehicles in the recommended exemption.

45. For these reasons, with the exception of the exemption discussed above, the gtr is recommended to apply to category 1-1 vehicles with a GVM exceeding 500 kg; and to category 1-2 and category 2 vehicles with a GVM exceeding 500 kg but not exceeding 4,500 kg. In addition, the group recommends that a Contracting Party may restrict application of the requirements in its domestic legislation if it decides that such restriction is appropriate.

46. Regarding the applicability of this gtr, it should be noted that the requirements of the draft gtr are substantially more severe than any existing legislation at the time of adoption of the gtr. In addition, many countries do not yet have pedestrian safety requirements. It is therefore recommended that Contracting Parties implementing this gtr allow adequate lead time before full mandatory application, considering the necessary vehicle development time and product lifecycle.

47. Furthermore, during the development phase of this gtr, the main focus was on vehicles of a GVM of 2,500 kg or less, that are also addressed in all existing legislation. The later extension to other vehicles however needs to recognise that some additional lead-time may be necessary, because many current vehicles, exempted from existing national or regional requirements, are now included. In addition, while the test procedures and requirements of this gtr were based on requirements originally developed for "classical" (sedan type) passenger cars, the gtr now also covers vehicles

with specific shapes or features (High Front Vehicles, special purpose vehicles, etc.), for which it is recognised that special consideration may be needed.

B. Items for Future Consideration

48. During the meeting discussions it became clear that some issues could not be fully resolved within the timeframe of the terms of reference for the informal group. The group recommended that the following issues should be addressed in the future.

1. Lower legform impactor

49. As the FlexPLI is considered by some to have high biofidelity and excellent injury assessment ability, the FlexPLI should be considered as a potential tool to replace the TRL lower legform impactor in the future. However, because of the lack of experience in using the FlexPLI as a certification tool, a further confirmation process is needed. Therefore, WP.29/GRSP was requested to set up a Technical Evaluation Group (TEG). This TEG will, based on independent studies and relevant information provided by its members, monitor the reliability of the FlexPLI as a certification tool. The TEG will advise GRSP on the suitability of the FlexPLI to be used for testing and compliance verification purposes. The TEG should also propose an effective date of entry into force and the date by which the FlexPLI could supersede the rigid lower legform impactor. The TEG will also propose a transitional period, during which the FlexPLI and the rigid lower legform impactor can be used as alternatives.

2. Upper legform impactor to high bumper test

50. The group suggested that there should be more research and development on the possibility of an improved upper legform impactor to be carried out for its possible future use. In addition, it is felt that more consideration should be given to the definition of a high bumper and the method of testing.

3. Upper legform impactor to bonnet leading edge test

51. Test results using the proposed upper legform to bonnet leading edge test prescriptions are contradictory to the actual situation encountered in many real-world accidents. This has been shown in several accident studies comparing modern "stream-lined" vehicle fronts registered in or after 1990 and older vehicles from the seventies or eighties. The accident studies, using French data, were performed by the Laboratoire d'Accidentologie de Biomechanique (LAB) (INF GR/PS/30) and by the University of Dresden using the German GIDAS data (INF GR/PS/92). In addition, EEVC-Working Group 17 (WG17) summarized, in their 1998 report, that no serious (Abbreviated Injury Scale 2+ (AIS2+)) upper leg or pelvis injuries caused by the bonnet leading edge were found for post-1990 car models impacting a pedestrian at a speed up to 40 km/h.

52. This fact, together with the existing concerns on the impact energy, the test tool biofidelity and the injury acceptance levels, caused the group to exclude consideration of the test at this stage. However, the group recognises that this test may have future value and suggests that further research into the needs and methods for this test should be completed.

Annex

TERMS OF REFERENCE OF THE GRSP INFORMAL GROUP ON PEDESTRIAN SAFETY ADOPTED BY GRSP AT ITS THIRTY-FIRST SESSION

The development of the informal group within GRSP on the topic of pedestrian safety should be seen as a concentration of effort within GRSP and not a duplication of existing groups.

The work could examine and combine the efforts of the work done by Japan, the United States of America, EEVC, IHRA and any other governmental and nongovernmental organizations in the area of pedestrian safety. It could then further develop the knowledge and requirements. The aim of the group is to report and present a performance-based proposal for the testing and qualification of vehicles, including passenger cars, vans, and light trucks, with respect to pedestrian safety, which could reasonably be incorporated in a global technical regulation (gtr).

In developing such a report, the informal group should give consideration to:

(a) clarification of the number and source of the injuries (e.g., hood, windshield, pavement), the relative importance of fatal injury mechanisms and areas of the body affected;

(b) objective(s) and benefits of any new regulation (or amendments to existing regulations) with reference to present levels and sources of knowledge;

(c) use of the best available technology and improvements in technology that will provide significant steps in developing methods and in achieving and improving benefits, including both active and passive safety measures;

(d) the costs, both monetary and social, that may be attendant to each level of regulatory stringency or performance;

(e) the relationship or potential interaction of any proposed technical regulation to other regulations currently in force or to be adopted either individually by any Contracting Party or under existing Agreements administered by WP.29.

The informal group will have the responsibility of preparing and bringing forward a proposal for a gtr, based upon the research and development work done so far by different institutions and the industry, and take account of any additional work that is being undertaken.

The preparation of the proposal shall consist of two phases:

Phase 1:
The informal group shall prepare a written analysis of the feasibility and desirability for a gtr on pedestrian safety and submit it to the Executive Committee (AC.3) by the end of 2003.
The group shall investigate recommendations and methods of implementation with a view to the development of a global technical regulation.

Phase 2
Assuming that the Executive Committee of the 1998 Global Agreement maintains its previously expressed support for the development of a gtr, the informal group shall develop complete and detailed recommendations, in compliance with paragraph 6.3.4. of Article 6 of the 1998 Agreement, by the end of 2005.

Appendix

REFERENCE DOCUMENTS USED BY THE WORKING GROUP

A list of informal documents used by this Informal group is listed and available on the UNECE WP.29 website (http://www.unece.org/trans/main/welcwp29.htm).

Number of working paper	Title of informal document
INF GR/PS/1	Agenda 1st meeting
INF GR/PS/2	Terms of reference
INF GR/PS/3	IHRA accident study presentation
INF GR/PS/4	JMLIT proposed legislation
INF GR/PS/5	IHRA feasibility study
INF GR/PS/6	Japan information on possible scope
INF GR/PS/7	Attendance list 1st meeting
INF GR/PS/8	Draft Meeting Minutes 1st meeting
INF GR/PS/9	Report to GRSP 32 inf doc.
INF GR/PS/10	Draft action plan
INF GR/PS/11	Agenda 2nd meeting
INF GR/PS/12	GIDAS accident data
INF GR/PS/13	GIDAS accident data graphs
INF GR/PS/14	Italian accident data
INF GR/PS/15	UN accident data
INF GR/PS/16	Spanish accident data
INF GR/PS/17	ACEA accident data
INF GR/PS/18	Draft Meeting Minutes 2nd meeting
INF GR/PS/19	Agenda 3rd meeting
INF GR/PS/20	Canadian accident data
INF GR/PS/21	Netherlands accident data
INF GR/PS/22	Scope overview
INF GR/PS/23	Draft content table preliminary report
INF GR/PS/24	Attendance list 3rd meeting
INF GR/PS/25	GIDAS presentation
INF GR/PS/26	Leg injuries ITARDA
INF GR/PS/27	Draft Meeting Minutes 3rd meeting
INF GR/PS/28	Technical feasibility general
INF GR/PS/29	Infrastructure effectiveness
INF GR/PS/30	Pelvis / Femur fracture
INF GR/PS/31	IHRA/PS-WG Pedestrian accident data
INF GR/PS/32	ESV summary paper on IHRA/PS-WG report
INF GR/PS/33	Introduction of the regulation of pedestrian head protection in Japan; Nishimoto, Toshiyuki

INF GR/PS/34	Proposal for a directive of the European Parliament and the Council relating to the protection of pedestrians and other vulnerable road users in the event of a collision with a motor vehicle and amending Directive 70/156/EEC; Commission of the European Communities, Brussels, February 2003
INF GR/PS/35	List of conflicts with existing legislation / requirements
INF GR/PS/36	Draft preliminary report
INF GR/PS/37	Agenda 4th meeting
INF GR/PS/38	Technical prescriptions concerning test provisions for pedestrian safety
INF GR/PS/39	Vehicle safety standards report 1
INF GR/PS/40	US Cumulative 2002 Fleet GVMR
INF GR/PS/41	Swedish accident data
INF GR/PS/42	TRANS/WP.29/GRSG/2003/10 proposal for common definitions
INF GR/PS/43	Category 1-1 GVM
INF GR/PS/44	Light duty truck
INF GR/PS/45	EURO-NCAP results and what they mean in relation to EU Phase 1
INF GR/PS/46	JAMA / JARI child and adult head impactors
INF GR/PS/47	Preliminary report to GRSP 33
INF GR/PS/48	Draft meeting minutes 4th meeting
INF GR/PS/49	IHRA child head test method
INF GR/PS/50	IHRA adult head test method
INF GR/PS/51	Attendance list 4th meeting
INF GR/PS/52	Provisional agenda for the 5th meeting
INF GR/PS/53	Draft gtr format
INF GR/PS/54	gtr proposal to WP.29
INF GR/PS/55	Draft gtr
INF GR/PS/56	Comparison table
INF GR/PS/57	Proposed schedule of the group
INF GR/PS/58	Presentation on vehicle shape, boundary line, ...
INF GR/PS/59	A-pillar IHRA OICA presentation
INF GR/PS/60	ISO/TC22/SC10/WG2 N613
INF GR/PS/61	IHRA PS 237
INF GR/PS/62	Action plan from 5th meeting
INF GR/PS/63	Attendance list 5th meeting
INF GR/PS/64	Draft meeting minutes 5th meeting
INF GR/PS/65	Provisional agenda for the 6th meeting
INF GR/PS/66	AUS-NCAP pedestrian data
INF GR/PS/67	Test-method - active hood / bonnet systems
INF GR/PS/68	Target population head injuries - US
INF GR/PS/69	Working paper draft gtr
INF GR/PS/70	Korean information
INF GR/PS/71	Head test area windscreen + A-pillar
INF GR/PS/72	Head test data on windscreen
INF GR/PS/73	Head impact angle / speed re-assessment based on vehicle geometry

INF GR/PS/74	IHRA/PS/270 headform impactor specification
INF GR/PS/75	Powerpoint explanation of PS/67
INF GR/PS/76	IHRA legform discussions
INF GR/PS/77	Corridors proposed by UVA (lower legform)
INF GR/PS/78	Bio rating method: Maltese
INF GR/PS/79	IHRA antropometric proposal
INF GR/PS/80	IHRA/PS/278
INF GR/PS/81	Schedule for legform impactor for gtr
INF GR/PS/82	Injury threshold for ped legform test
INF GR/PS/83	Decided items and action items of the 6th meeting
INF GR/PS/84	Draft meeting minutes of the 6th meeting
INF GR/PS/85	Attendance list of the 6th meeting
INF GR/PS/86	Draft gtr EU working document
INF GR/PS/87	IHRA PS 273 Development of FlexPLI2003
INF GR/PS/88	Second interim report to GRSP 35
INF GR/PS/89	EU Feasibility Study Phase 2
INF GR/PS/90	Provisional agenda for the 7th meeting
INF GR/PS/91	ACEA feasibility study Phase 2
INF GR/PS/92	ACEA equal effectiveness study Phase 2
INF GR/PS/93	Design of head impactor
INF GR/PS/94	Front windshield
INF GR/PS/95	JPN comment on PS 86 Rev 2 + English text of Japanese technical standard
INF GR/PS/96	Problem of undamped accelerometer
INF GR/PS/97	Durability and repeatability of headform skin
INF GR/PS/98	IHRA PS 310 decision for legform test
INF GR/PS/99	Skin aging of head impactor
INF GR/PS/100	OICA proposed amendments to PS/95
INF GR/PS/101	JAMA feasibility study Phase 2
INF GR/PS/102	OICA windscreen testing according to EURO-NCAP protocol
INF GR/PS/103	CLEPA windscreen testing on one car model
INF GR/PS/104	Draft CLEPA / OICA document on active bonnet testing
INF GR/PS/105	Lower leg research for developing corridors
INF GR/PS/106	J-MLIT proposal for FlexPLI answering item 9 of PS/83
INF GR/PS/107	NHTSA proposal for guidelines of preamble
INF GR/PS/108	JAMA information on high bumper definition
INF GR/PS/109	Chairman proposal for FlexPLI and rigid impactor use in gtr
INF GR/PS/110	OICA proposal for side and rear windscreen reference line
INF GR/PS/111	Guideline for preamble
INF GR/PS/112	Action plan
INF GR/PS/113	Revision of draft gtr
INF GR/PS/114	Attendance list
INF GR/PS/115	Draft meeting minutes of the 7th meeting
INF GR/PS/116	Cleaned up version of draft gtr

INF GR/PS/117	Preamble and draft gtr off doc for GRSP 37
INF GR/PS/118	Provisional agenda for the 8th meeting
INF GR/PS/119	ISO Activities for Pedestrian Safety
INF GR/PS/120	EC final feasibility study
INF GR/PS/121	GRSP/2005/3 as amended during GRSP/37
INF GR/PS/122	GRSP-37-18
INF GR/PS/123	GRSP-37-15
INF GR/PS/124	GRSP-37-16
INF GR/PS/125	Short report on comments received during GRSP-37
INF GR/PS/126	July meeting task list
INF GR/PS/127	Presentation on EU Phase 2
INF GR/PS/128	The need for harmonised legislation on pedestrian protection
INF GR/PS/129	Comparison between the J standard and the EU Phase 2 proposal for head testing
INF GR/PS/130	List of references for EU / EEVC on head impact angles
INF GR/PS/131	Analysis of pedestrian accident situation and portion addressed by this gtr
INF GR/PS/132	gtr testing and what it means for the US situation
INF GR/PS/133	Proposal to solve the undamped accelerometer problem
INF GR/PS/134	Concerns on paragraph 7.4. with testing on the centre of the windscreen
INF GR/PS/135	OICA proposal for paragraph 3.33
INF GR/PS/136	OICA proposal for a mass for the upper leg impactor
INF GR/PS/137	OICA proposal on definition of high bumper vehicles
INF GR/PS/138	Economic effectiveness study from Korea
INF GR/PS/139	Action list of 8th meeting
INF GR/PS/140	IHRA Injury breakdown background document for PS/131
INF GR/PS/141	Update of PS67 on certification standard for deployable systems
INF GR/PS/142	Relative humidity of Korea
INF GR/PS/143	Draft gtr based on INF GR/PS/121 as amended during the 8th meeting
INF GR/PS/144	Draft meeting minutes of the 8th meeting
INF GR/PS/145	Attendance list 8th meeting
INF GR/PS/146	Flex-TEG Activities updating PS 124
INF GR/PS/147	Actions 1 3 4 6 9 of 8th meeting
INF GR/PS/148	Action 9 of 8th meeting doc FTSS_4[1].5kg_headform
INF GR/PS/149	Adult headform moment of inertia
INF GR/PS/150	Development of a head impact test, Glaeser
INF GR/PS/151	gtr preamble for accelerometer
INF GR/PS/152	Provisional agenda for the 9th meeting
INF GR/PS/153	Explanation of amendments from PS/143 to PS/143 Rev1
INF GR/PS/154	Handling guide for the TRL leg
INF GR/PS/155	LWRL definition
INF GR/PS/156	Impact angles for headform to windscreen tests
INF GR/PS/157	HIC limits for headform to windscreen tests
INF GR/PS/158	Headform to bonnet tests

INF GR/PS/159	Definition high bumper vehicles
INF GR/PS/160	Revised preamble replacing the preamble in PS/143 Rev. 1
INF GR/PS/161 and Rev 1 / 2	EU proposed amendments to PS/143 Rev. 1
INF GR/PS/162	Explanation of EU proposals to amend PS/143 Rev. 1
INF GR/PS/163	Windscreen impact testing
INF GR/PS/164	Windscreen fracture modes
INF GR/PS/165	Leg feasibility testing
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INF GR/PS/167	EU field data on crossbeam height
INF GR/PS/168	HIC15 vs HIC36 headaccel analysis
INF GR/PS/169	Revising PS/131 ~ Analysis of Pedestrian Accident and gtr Application
INF GR/PS/170	Target population for this gtr
INF GR/PS/171	Draft meeting minutes of the 9th meeting
INF GR/PS/172	Attendance list 9th meeting
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INF GR/PS/174 and Rev 1	Lower leg tests - EuroNCAP data - OICA presentation for Jan 06 meeting
INF GR/PS/175 and Rev 1 / 2	Bumper Reference Lines - OICA presentation for Jan 06 meeting
INF GR/PS/176 and Rev 1 / 2	Headform test results - OICA presentation for Jan 06 meeting
INF GR/PS/177	IHRA-PS Proposal for the Moment of Inertia of GTR Adult-Child Headform Impactors
INF GR/PS/178	Expected life-saving effect_GTR_Head_Japan
INF GR/PS/179	Ongoing Researches on Pedestrian Leg Injuries Assessment
INF GR/PS/180	OICA position on the change of the definition of the ble reference line
INF GR/PS/181	Comparison lower leg injuries for different AIS levels
INF GR/PS/182	Foam memory for changing humidity
INF GR/PS/183	OICA position on bonnet leading edge 165 mm exemption zone
INF GR/PS/184	Final draft gtr (without preamble)
INF GR/PS/185	Mr Saul letter dd 3/1/06
INF GR/PS/186	NHTSA revision of preamble PS/160
INF GR/PS/187	EEVC WG17 report
INF GR/PS/188	Draft meeting minutes of the 10th meeting
INF GR/PS/189	Attendance list 10th meeting

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