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Item 16.3 of the provisional agenda

Progress on the development of new global technical regulations (gtrs) and of amendments to established

global technical regulations (gtrs) — Gtr No. 9 (Pedestrian safety)

Second progress report for Phase 2 of gtr No. 9 (Pedestrian safety)

Submitted by the Chair of the informal working group on Phase 2 of gtr No. 9*

The text reproduced below was prepared by the Chair of the informal working group. It is based on informal document WP.29-157-21, distributed at the 157th session (ECE/TRANS/WP.29/1097, paragraph 86). This document, if adopted, shall be appended to the amendment to the gtr in accordance with the provisions of paras. 6.3.4.2., 6.3.7. and 6.4. of the 1998 Agreement.

* In accordance with the programme of work of the Inland Transport Committee for 2010–2014 (ECE/TRANS/208, para. 106 and ECE/TRANS/2010/8, programme activity 02.4), the World Forum will develop, harmonize and update regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

I. Objective of this proposal

1. The representatives of Japan and Germany proposed the development of Phase 2 of gtr No. 9. The main objective is the development of a draft proposal to amend the global technical regulation No. 9 - Phase 2 on pedestrian safety by introducing the flexible pedestrian legform impactor (FlexPLI) as a single harmonized test tool in order to enhance the level of protection for lower legs of pedestrians.
2. The work of the informal group shall not be limited to draft proposals to amend gtr No. 9, but shall cover the development of a complementary draft proposal to amend the draft Regulation on pedestrian safety.
3. The group may also review proposals to improve and/or clarify aspects of the legform test procedure.

II. Background

4. At the 154th session of the World Forum for Harmonization of Vehicle Regulations (WP.29) and the 32nd session of the Executive Committee of the 1998 Agreement (AC.3) it was agreed to set up an informal group to solve the pending issues for the incorporation of the FlexPLI in Phase 2 of the gtr No. 9 and in the draft Regulation on pedestrian safety, subject to the submission to WP.29 and to AC.3 of appropriate terms of references (document ECE/TRANS/WP.29/1091, paras. 36 and 100).
5. The representatives of Japan and Germany have informed WP.29 and AC.3 that this informal working group on global technical regulation No. 9 (IG gtr9) - Phase 2 would be co-sponsored by Japan and Germany.
6. The informal working group has started its work on 3 November 2011 with a Constitutional Meeting in Bonn, Germany, to draft a document on the terms of references, the operating principles, the schedule and the work plan. At this occasion the participants agreed to the proposal of Japan and Germany that the informal group will be managed by Germany (chair), Japan (vice-chair) and OICA (secretary).
7. At the 155th session of WP.29 and at the 33rd session of AC.3 the representatives of Japan and Germany informed about the on-going activities of the informal working group on gtr No. 9 Phase 2 (Informal document WP.29-155-35). WP.29 and AC.3 were informed about the constitutional meeting and the management of the group. Moreover, it was informed that the first meeting was planned on 1 and 2 December 2011 to start the technical discussion and to finalize the draft terms of references as well as the work plan for submission to GRSP in December 2011.
8. The first meeting of the informal working group was held on 1 and 2 December 2011 in Geneva, Switzerland. The technical discussion was started and the draft document on the terms of references, the operating principles, the schedule and the work plan for submission to GRSP in December 2011 was finalised. The first progress report was submitted to the December 2011 session of GRSP and to WP.29 and AC.3 at their March 2012 sessions. At that session the World Forum endorsed in principle the above mentioned terms of references, pending the adoption of the report of the December 2011 session of GRSP. AC.3 endorsed in principle the terms of reference of the informal working group and requested the secretariat to distribute WP.29-156-11 with an official symbol at its June 2012 session.
9. The second meeting of the informal working group took place on 28 and 29 March 2012 in Osaka, Japan. The discussion was focused on the technical aspects including the

accident and benefit analysis. Main priority was also given to discuss the activities on the further development of the certification procedures. For one further work item a task force was initiated to work on the bumper test area for the lower legform impact. The second progress report was planned to be submitted to WP.29 and AC.3 at their November 2012 sessions.

III. Subjects for review and tasks to be undertaken (terms of reference)

10. The informal working group set up an activity list to address remaining items for the introduction of the Flexible Pedestrian Legform Impactor (FlexPLI):

- (a) Review and consideration of remaining items
 - (i) Review of Flex-Technical Evaluation Group (TEG) activities → to reach common understanding
 - (ii) Assessment of biofidelity (comparison of FlexPLI and Enhanced European Vehicle safety Committee (EEVC) lower legform impactor)
 - (iii) Assessment of benefit and costs (injury reduction, additional benefit compared to EEVC lower legform impactor)
 - (iv) Technical specifications (drawings) and Procedures for Assembly, Disassembly and Inspection (PADI) (user manual)
 - (v) Evaluation of durability
 - (vi) Test procedure (rebound phase, best practice, velocity measurement etc.)
 - (vii) Certification tests
 - (viii) Review and exchange of test results
 - (ix) Evaluation of reproducibility and repeatability
 - (x) Evaluate and decide on performance / injury criteria and threshold values
 - (xi) Evaluation of vehicle countermeasures (assessment of technical feasibility)
- (b) Develop a draft proposal to amend UN Gtr No. 9 - Phase 2
- (c) Develop a complementary draft proposal to amend draft Regulation on Pedestrian Safety (including a recommendation for transitional provisions based on item 1).

IV History of the discussions

A. Benefit and costs

11. At the second meeting the experts reviewed again the information from the Japan Automobile Standard Internationalization Centre (JASIC) on the benefit of the FlexPLI. The presentation of the first meeting has been updated by showing a significantly better biofidelity of the FlexPLI compared to the current legform impactor.

12. The expert from OICA explained that the United States of America (USA) accident data used for the study might be processed in another way, as the current procedure in using

Abbreviated Injury Scale (AIS) coding might not be correct for pedestrian injuries. The expert from JASIC admitted that for some cases the AIS coding used for the study was not correct. However, during the meeting a modified version of the study was presented showing better results than the original document. To give experts the opportunity of reconsideration this topic will stay on the agenda for the third meeting of the informal working group.

B. Biofidelity

13. The expert from JASIC showed once again the biofidelity study performed with data from Japan and the USA. Some concerns were raised by the Alliance of Automobile Manufacturers regarding the validity of the method used by JASIC in comparing the finite element models with human body models. These concerns were not shared by the expert from Japan.

14. The expert from United Kingdom (UK) asked if the FlexPLI would have limitations in assessing knee injuries. The expert from Japan explained that both, knee injuries and tibia fractures could be assessed. But during the development it was given higher priority to tibia fractures as the knee injuries are less represented compared to tibia fractures according to the accident data analyses. The expert from UK would check the accident statistics accordingly.

15. It was agreed to discuss the whole subject further at the next meeting of the informal working group.

C. Accident analysis

13. The expert from NHTSA informed delegations about a research project in the USA to investigate the accident situation for pedestrians using the Pedestrian Crash Data Study (PCDS) and the German In-Depth Accident Study (GIDAS). The analyses only cover AIS 3-6 injuries, looking at disabling injuries according to the Functional Capacity Index (FCI) based on AIS.

14. According to both data sources, bumper-caused injuries represent up to 40 per cent of all pedestrian injuries. Despite there are notable differences between the two sources regarding the number of injuries to the different body regions the number of injuries to lower extremities caused by the bumper is in both cases close to 100 per cent (94 per cent for PCDS and 99 per cent for GIDAS). The presentation also showed the ranking of injured body regions for serious and disabling injuries.

15. Experts of the informal working group were informed that these results are preliminary and the final results can be provided most likely at the fourth meeting of the informal group.

D. Task Force for Review and Update Certification Corridor (TF-RUCC) (certification procedures)

16. The expert from Japan gave a status report of the activities of the task force reviewing and updating the certification corridors. He added that his country has not finalised the tests because of some delay of the manufacturer in preparing the flexible legform impactors for the tests. However the first results show a good and repeatable performance of the three flexible pedestrian legform impactors tested. Finalisation of the

tests in Japan was planned for April. The second test lab of the Berichte der Bundesanstalt für Straßenwesen (BASt) would receive the impactors afterwards.

17. Despite the extensive work of the task force, the progress was delayed and the current schedule is aiming at finalising the task to update the certification corridors, if necessary, until the third meeting of the informal group. The task force will prepare a recommendation for the informal group on the certification procedures and the corridors to be used for the calibration of the FlexPLI.

E. Status of FlexPLI

18. The expert from the dummy's manufacturer gave an update on the current status of the FlexPLI development. Information was provided on the quality assurance system used during the production and maintenance of the legform impactors. This includes the documentation of the different build level of the individual impactors. The expert from Humanetics explained in detail the changes of the build level during the development of the impactors.

F. Technical specifications and user manual

19. The expert from the manufacturer presented the current version of the user manual that is distributed to the informal group. The manual will be updated with additional information for a visual inspection.

20. The expert from OICA asked for a more transparent documentation of the setup of the flexible pedestrian legform impactor. The expert from the dummy's manufacturer confirmed that all documentation will be available as soon as the FlexPLI will become part of legislation.

21. The expert from the UK informed the participants about the on-going activity at WP.29 to set up a Special Resolution No. 2 (S.R.2) in the future that would form a kind of library for dummies and other test devices used in regulations. The UK and the USA are currently preparing the wording of such a resolution. The idea is to differentiate between information that is needed for test laboratories only, which should be put into the S.R.2, and information that is needed for the test procedure, which should be put into the respective piece of legislation. The intention is to draft the S.R.2 in a way that allows the application for the UN regulations, under the 1958 and the 1998 Agreements.

22. During the discussion at the informal working group of global technical regulation No. 7 (gtr7) Phase II on the BioRID it was already agreed that engineering drawings of dummies and dummy parts will be shared but not manufacturing drawings. The current proposal foresees that drawings would be made available during the discussion period only for information purposes covering a disclaimer that it may not be used for commercial purposes. After dummies and dummy parts would have been finally agreed the disclaimers on the drawings would be removed and the engineering drawings will be made available.

23. The expert from the dummy's manufacturer would provide information if the documentation for the FlexPLI could be made available for the informal group with a disclaimer that it might not be used for commercial purposes.

G. Review and exchange of test results

24. The expert from OICA introduced results of impactor to vehicle tests. He added that the results were quite promising but for some peak values a deviation of up to 20 per cent

was observed. A discussion took place if the impactors as well as the vehicles would really be comparable as the test results presented were generated during a period of several years (2009 to 2011), while the impactors and the vehicles may have undergone some changes. The expert from OICA would clarify if the vehicles tested were still comparable.

H. Durability

25. Certification test data on the long term performance of the FlexPLI was shown by BAST. The expert from OICA had some questions with regard to the differences in some of the results. It was agreed to discuss this subject at the next meeting as soon as further data is available on the build level of the impactor. Data of a second impactor would also be provided by BAST.

I. Test procedure

26. On request of the expert from the European Commission a discussion on the current bumper test area for the lower legform impact was started. The day before the second informal working group meeting, a meeting took place to discuss this subject separately. The necessity of improvements to the test procedure for the lower legform test was shown, as the area of the bumper tested is quite limited due to some design features on the front of some vehicles that interact with the current test procedure. The decision was to discuss the whole subject in detail in a specific task force on the bumper test area.

27. The informal working group agreed to install such a task force. However it was agreed, that depending on the progress of the task force on the bumper test area, it might be needed at a later stage to separate the discussion on this subject from the discussion on the FlexPLI. Currently the discussion on the bumper test area would be part of the informal group but it would finally not delay any decision on the main subject of the group, the introduction of the new legform impactor.

J. Finite element models

28. The expert from the dummy's manufacturer informed participants about the status of the work to develop a finite element model for the FlexPLI. Currently a model is available for purchase. The further development of the model is currently stopped and would be restarted as soon as the final status of the impactor is known.

K. Activity list and schedule

29. The informal working group would plan to start the vehicle testing with several impactors after the finalisation of the work on the certification procedure. According to the progress of the task force a discussion of the work schedule would take place at the third meeting of the informal group.

L. Work schedule

Overall Schedule

P.R.: Progress Report

Year	2011			2012												2013											
Month	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	
WP29		○																									
GRSP																											
IG-GTR9-PH2		○	○			○		○							○												

May 2011	Proposal of Draft ToR to GRSP (informal document)
June 2011	GRSP to seek consent of WP.29 and AC.3 to mandate new informal group on pedestrian protection
03 November 2011 (Bonn, DE)	Constitutional meeting of the IG GTR9-PH2
November 2011	Report to WP.29 on activities of IG
01/02 December 2011 (Geneva, CH)	First meeting of the IG GTR9-PH2
December 2011	Progress-Report to GRSP, submission of Draft ToR to WP.29
March 2012	Progress-Report to WP.29 and adoption of ToR by WP.29 / AC.3
28 and 29 March 2012 (Osaka, JP)	Second meeting of the IG GTR9-PH2
May 2012	Progress-Report to GRSP
29 and 30 May 2012 (Paris, FR)	Third meeting of the IG GTR9-PH2
18 and 19 Sept. 2012 (Washington DC, USA)	Fourth meeting of the IG GTR9-PH2
November 2012	Progress-Report to WP.29
December 2012	Fifth meeting of the IG GTR9-PH2
December 2012	Progress report and submission of informal draft documents to GRSP
March 2013	Sixth meeting of the IG GTR9-PH2
May 2013	Submit formal proposal to GRSP, adoption by GRSP, submit formal proposal to WP.29
November 2013	Adoption by WP.29

V. Documents

30. Documents for the meetings

ECE/TRANS/ WP.29/GRSP/ 2011/13	Japan	Proposal for Amendment 2 to global technical regulation No. 9 (Pedestrian safety)
GRSP-49-38	Japan and Germany	Draft terms of reference for the informal group on pedestrian safety phase 2 (IG PS2)
ECE/TRANS/ WP.29/1091		Reports of the World Forum for Harmonization of Vehicle Regulations on its 154th session, Administrative Committee of the 1958 Agreement on its forty-eighth session, Executive Committee of the 1998 Agreement on its thirty-second session, Administrative

		Committee of the 1997 Agreement on its eighth session
GTR9-C-01	Chair	Agenda for the constitutional meeting of the Informal Group on Pedestrian Safety Phase 2 (IG PS2)
GTR9-C-01r1	Chair	Agenda for the constitutional meeting of the Informal Group on Pedestrian Safety Phase 2 (IG PS2)
GTR9-C-02	Chair/Secretary	Minutes of the Constitutional Meeting of the Informal Group on Global Technical Regulation No. 9 – Phase 2 (IG GTR9-PH2)
GTR9-C-02r1	Chair/Secretary	Minutes of the Constitutional Meeting of the Informal Group on Global Technical Regulation No. 9 – Phase 2 (IG GTR9-PH2)
GTR9-C-03	Japan/Germany	Informal document GRSP-49-38: Draft Terms of Reference for the Informal Group on Pedestrian Safety Phase 2 (IG PS2)
GTR9-C-04	Japan	History of Development of the FlexPLI
GTR9-C-05	Japan	Review of the FlexPLI TEG Activities
GTR9-C-06	OICA	Comments on the Draft Terms of Reference for the Informal Group on Pedestrian Safety Phase 2 (28/10/2011)
GTR9-C-07	Chair	Final Operating Principles and Terms of Reference for the IG GTR9-PH2
GTR9-C-07r1	Chair	Final Operating Principles and Terms of Reference for the IG GTR9-PH2
GTR9-C-08	Secretary	TEG document matrix
GTR9-1-01	Chair/ Secretary	Agenda for the 1st meeting of the Informal Group on Global Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2)
GTR9-1-01r1	Chair/Secretary	Agenda for the 1st meeting of the Informal Group on Global Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2)
GTR9-1-02	Chair/ Secretary	Minutes of the 1st meeting of the Informal Group on Global Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2) – Draft
GTR9-1-02r1	Chair/ Secretary	Minutes of the 1st meeting of the Informal Group on Global Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2) – Final
GTR9-1-03	Japan	Work plan of Task Force Review and Update of Certification Corridors (TF-RUCC)
GTR9-1-03r1	Japan	Work plan of Task Force Review and Update of Certification Corridors (TF-RUCC)
GTR9-1-04	OICA	FlexPLI Version GTR Prototype SN-02 - Durability Assessment
GTR9-1-05	JASIC	Technical Discussion - Biofidelity
GTR9-1-05r1	JASIC	Technical Discussion – Biofidelity (revised)
GTR9-1-06	JASIC	Technical Discussion - Injury Criteria
GTR9-1-06r1	JASIC	Technical Discussion - Injury Criteria (revised)
GTR9-1-07	JASIC	Technical Discussion - Benefit
GTR9-1-07r1	JASIC	Technical Discussion – Benefit (revised)
GTR9-1-08	Dummy's manufacturer	FlexPLI GTR status 1 / 2 December 2011
GTR9-1-08r1	Dummy's manufacturer	FlexPLI GTR status 1 / 2 December 2011
GTR9-1-09	Japan/ Germany	Informal document WP.29-155-35: Report to the November session of WP.29 on the activities of the IG GTR9-PH2
GTR9-1-10c1	Dummy's manufacturer	Flex-GTR changes list since prototype built, status 02 Dec. 2010 (corrected)
GTR9-1-11	Bertrandt	Pendulum Test Scatter
GTR9-1-12	United States	Informal document GRSP-49-23: Update on Pedestrian Leg Testing
GTR9-2-01	Chair/ Secretary	Agenda for the 2nd meeting of the Informal Group on Global Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2) – Draft
GTR9-2-01r1	Chair/ Secretary	Agenda for the 2nd meeting of the Informal Group on Global

		Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2) – Final
GTR9-2-02	Chair/ Secretary	Minutes of the 2nd meeting of the Informal Group on Global
GTR9-2-03	BASt	Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2) – Draft Proposal for a Modification of the Bumper Test Area for Lower and Upper Legform to Bumper Tests
GTR9-2-04	BASt	Robustness of SN02 prototype test results
GTR9-2-05	BASt	Comparison of Filter Classes for FlexPLI
GTR9-2-06	OICA	Technical Specification and PADI
GTR9-2-07	JASIC	Technical Discussion – Benefit; Updated Version of Document GTR9-1-07r1 (Note: The document was not presented since a revision 1 of the document was already available for the meeting)
GTR9-2-07r1	JASIC	Technical Discussion – Benefit; Updated Version of Document GTR9-1-07r1
GTR9-2-08	Dummy's manufacturer	Flex PLI GTR meeting actions
GTR9-2-09	Dummy's manufacturer	FLEX PLI GTR –FE v2.0IG FLEX GTR9-PH2
GTR9-2-10	OICA	FlexPLI Comparison (Impactors: SN02, SN04, IND-Impactor - Test experiences)
GTR9-2-11	Chair	Informal document WP.29-156-11: First progress report of the informal group on Phase 2 of gtr No. 9
GTR9-2-12	JASIC	Re-examination of Number of Pedestrians by Injury Severity
GTR9-2-13	Dummy's manufacturer	FLEX PLI Update for Alliance of Automobile Manufacturers
GTR9-2-14	JARI	Updated Japan Progress Report: Review and Update Certification Test Corridors and Test Methods (added pendulum Test data)
TF-RUCC-2-03	BASt	FlexPLI Inverse Certification Corridors-Further Test Results
TF-RUCC-2-04	ACEA	Comments on Inverse Certification Test Procedure
TF-RUCC-2-05	Dummy's manufacturer	Humanetics Inverse and Round Robin Leg Preparation
TF-RUCC-2-06	BGS Boehme & Gehring	Status of the FlexPLI – Inverse Certification
TF-RUCC-2-07r1	TF-RUCC Chair	Japan Progress Report: Review and Update Certification Test Corridors and Test Methods
