

AMENDMENTS TO DRAFT GTR ON PEDESTRIAN PROTECTION ADOPTED BY GRSP
AT ITS FORTY-FIRST SESSION BASED ON ECE/TRANS/WP.29/GRSP/2006/2

A. STATEMENT OF TECHNICAL RATIONALE AND JUSTIFICATION

I. SAFETY NEED

Paragraph (a), amend to read:

"(a) Distribution of the Injuries

.....

The frequency of fatal and serious injuries (Abbreviated Injury Scale: AIS 2-6)..."

Paragraph (c), amend to read:

"(c) Target Population for this gtr

....

...It was found that bonnet/wing contacts..."

II. SUMMARY: DESCRIPTION OF THE PROPOSED REGULATION

Paragraph (a), indent 1, amend to read:

"(a) Introduction

.....

1. The group recognized that the A-pillars, windscreen roof and lower frames
On the other hand, the entire windscreen frame would need to be softened
extremely to pass any HIC (Head Injury Criterion) requirement...."

Paragraph (b),

"(b) Overview

.....

The HIC must not exceed 1,000 over one half of a child headform test area and must not exceed 1,000 over two thirds of a combined child and adult headform test areas...."

III. PROCEDURAL BACKGROUND

".....

The group had held the following meetings:

- 4-5 September, 2002, Paris, France
- 10 December, 2002, Geneva, Switzerland
- 15-16 January, 2003, Santa Oliva, Spain
- 15-16 May, 2003, Tokyo, Japan

- 10-12 September, 2003, Ottawa, Canada
- 24-26 February, 2004, Paris, France
- 28-30 September, 2004, Paris, France
- 11-13 July, 2005, Brussels, Belgium
- 5-6 December, 2005, Geneva, Switzerland
- 16-19 January, 2006, Washington DC, USA
-"

IV. EXISTING REGULATIONS, DIRECTIVES, AND INTERNATIONAL VOLUNTARY STANDARDS

Amend to read:

"....

This feasibility review has taken place and may result in amendments to the European requirements in its second phase, starting in 2010.

....In addition, the Canada and the USA are conducting preliminary investigation of the effects of bumper design on different leg test devices (TRL legform impactor; Polar dummy and flexible pedestrian legform impactor (Flex-PLI)).

....

....for adult and child head protection and for adult leg protection.

The International Organization for Standardization (ISO) created....

....

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."

V. GENERAL ISSUES

Subparagraph (b), amend to read:

"(b) Applicability

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).

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 M₁ vehicles up to 2,500 kg and N₁ vehicles up to 2,500 kg, which are derived from M₁. The ISO recommendations are for M₁ and N₁ 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.

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 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.

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.

There was considerable discussion over the mass of the vehicles to which this gtr should apply. Using the categories described in S.R.1, there were several options 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 usually is 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 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 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 could be unfeasible to define objectively what was meant by "same".

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 address effectively regional differences in pedestrian accident crash characteristics. The gtr would provide 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 of 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.

While this approach maximizes the discretion of jurisdictions to decide whether vehicles should be excluded from the gtr for feasibility or practical reasons, or for lack of 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 distortion in the market if Category 1-1 vehicles 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.

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.

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.

Furthermore, during the development phase of this gtr, the main focus was with 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."

Insert a new subparagraphs (d) and (e), to read:

"(d) Points Tested

The informal group considered whether to specify both the number of test points and the minimum spacing of such test points. On consideration, the group determined that the specification of such points did not have a place within this proposed gtr for the following reasons:

(i) For governments that use a self-certification regulatory framework, it was not considered necessary to mention the number of tests required for testing or their spacing, as it would be incumbent on vehicle manufacturers to ensure that vehicles comply with all the impact zone requirements defined within this proposed gtr when tested by the regulating authority.

(ii) For type approval, the number of tests that need to be carried out to satisfy the relevant authority that vehicles meet the requirements is an issue for that authority, which may specify the number of tests and the spacing between the test points.

(iii) The mention of a minimum number of tests or a minimum distance apart between tests could result in manufacturers being burdened with unnecessary tests and/or authorities being unnecessarily restricted in test programs, as it would be difficult to set a target that would encompass both the largest and smallest test zones, and the situation could arise where test zones could be smaller than the minimum number of tests required that could be fitted into that zone.

(e) Vehicle Design Position

As vehicles come in many variants and modifications, the ride height may vary greatly. Taking into account the differences between type approval and self certification, it is recommended that Contracting Parties take this into account upon national implementation of the gtr. As guidance to Contracting Parties, the EU addresses this issue by defining the concept of "primary reference marks". This definition (paragraph 2.2 of EU Commission Decision of 23 December 2003) reads: 'Primary reference marks' means holes, surfaces, marks and identification signs on the vehicle body. The type of reference mark used and the vertical (Z) position of each mark relative to the ground shall be specified by the vehicle manufacturer according to the running conditions specified in paragraph 2.3. These marks shall be selected such as to be able to easily check the vehicle front and rear ride heights and vehicle attitude.

If the primary reference marks are found to be within ± 25 mm of the design position in the vertical (Z) axis, then the design position shall be considered to be the normal ride height. If this condition is met, either the vehicle shall be adjusted to the design position, or all further measurements shall be adjusted, and tests performed, to simulate the vehicle being at the design position)."

Paragraph (d) (former), read as paragraph (f)

VI. PEDESTRIAN HEAD PROTECTION

Paragraph VI. Subparagraph (a), amend to read:

"(a) Test Areas

....

.....and at the rear by a WAD of 1,700 mm line....

...The child and adult headform test zones cover approximately 62 percent of the pedestrian cases (United States of America)....."

Subparagraph (b), to be deleted

Subparagraph (c), renumber as subparagraph (b) and amend to read:

"(b) Head injury criterion

....

...and must not exceed 1,000 over two thirds...

....."

Subparagraph (d), (former), renumber as subparagraph (c)

Paragraph (e),(former), renumber as paragraph (d) and amend to read:

"(d) Headform

.....

2. Headform Mass and Moment of Inertia

.....

This proposed gtr specifies the moment of inertia of the child and adult headforms as analyzed..... Therefore, the informal group slightly adjusted the upper limit for the child head impactor and finally adopted following values for the gtr headform impactors: 0.008 – 0.012 kgm² for the child headform and 0.010 – 0.013 kgm² for the adult headform.

The United Kingdom placed a reservation noting the mass of the child headform impactor (3.5 kg) differs from that specified in the corresponding EU Directive (2.5 kg). The United Kingdom expressed concerns that this may not provide a level of protection equivalent to that specified in the present EU Directive.

3. Headform Accelerometer

....As explained in INF GR/PS/96, ... Once a high resonance, over the Channel Amplitude Class (CAC) setting level, occurs,.... "

Subparagraph (f), read as subparagraph (e) and amend to read:

"(e) Headform test speed and angle

.....

.....three types of walking positions, three types of vehicles...

.....

The group thus decided to use the EEVC 50 degrees and 65 degrees impact angle for child and adult head testing while maintaining the higher EEVC impact speed to the bonnet of 35 km/h (compared to the IHRA speed of 32 km/h).

The Netherlands placed a reservation noting that the headform velocity, at the time of impact was lower than specified in the corresponding present EU Directive. The Netherlands feel that this is not expected to provide a level of protection equivalent to that specified in the present EU Directive."

VII, subparagraph (a)., amend to read:

"1. Purpose

....a lower legform impactor or an upper legform impactor,....

2. Rationale for Limiting the Lower Legform Test

.....

....The EEVC WG17 states in its report, paragraph 7.2.1. (see INF GR/PS/159):...

....

....Therefore, the group recommends.....

...."

Paragraph 3., delete Confor™ through the text and for INF PS/154/Rev.1 read INF GR PS/154/Rev.1

Paragraph VII, subparagraphs (b) and (c), amend to read:

"1. Impactor

It was agreed to recommend using the legform impactor developed by TRL, However, it was also recommended to consider

2. Injury Criteria

Knee injuries, which are one of the typical leg

....

(c) Upper Legform Test for High Bumpers

....For that reason, the informal working group recommends an upper legform test for vehicles with a lower bumper height of more than 500 mm.

....

1. Impactor

As the majority of victims of upper leg injuries are adults, the informal group generally agreed to recommend a....

....

2. Injury Criteria

....Accordingly, the informal group decided to recommend a...."

Paragraph VIII., amend to read:

"1. Systems or components that change position

....therefore decided to recommend such active...."

....

2. Active devices to protect pedestrians

.... standard as its basis.

...."

Paragraph IX, amend to read:

"...of pedestrian regulation globally.

It should not, however, be allowed to impose any restrictions on other measures, either active or passive, which may be utilised by any contracting party to provide additional benefits for the safety of vulnerable road users.

....

2. Leg Protection

The 32 per cent target population from INF GR/PS/169 includes both passenger cars and LTVs. The gtr exempts a rather large percentage of LTVs from having to test with a lower legform, therefore the target population should only include passenger cars and LTVs that have bumper heights below the defined cut off.

[New cost benefits analyses are awaited from the expert of the United States of America]...."

B. TEXT OF THE REGULATION

Paragraph 1., amend to read:

"1. PURPOSE"

Paragraph 2., amend to read:

"2. APPLICATION AND SCOPE

This global technical regulation (gtr) shall apply to the frontal surfaces of power driven vehicles of category 1-1 with a gross vehicle mass exceeding 500 kg; and of category 1-2 with a gross vehicle mass exceeding 500 kg but not exceeding 4,500 kg; and of category 2 with a gross vehicle mass exceeding 500 kg but not exceeding 4,500 kg ^{1/}. However, power driven 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 1000 mm, are exempt from the requirements of this regulation. All definitions of Special Resolution No. 1 shall apply as necessary."

Paragraph 3.1., amend to read:

"3.1. ..., by a wrap around distance (WAD) of...."

Paragraph 3.6., amend to read:

""Bonnet rear reference line" meanswith the windscreen (see Figure 2). The wiper blades and arms are removed during this process."

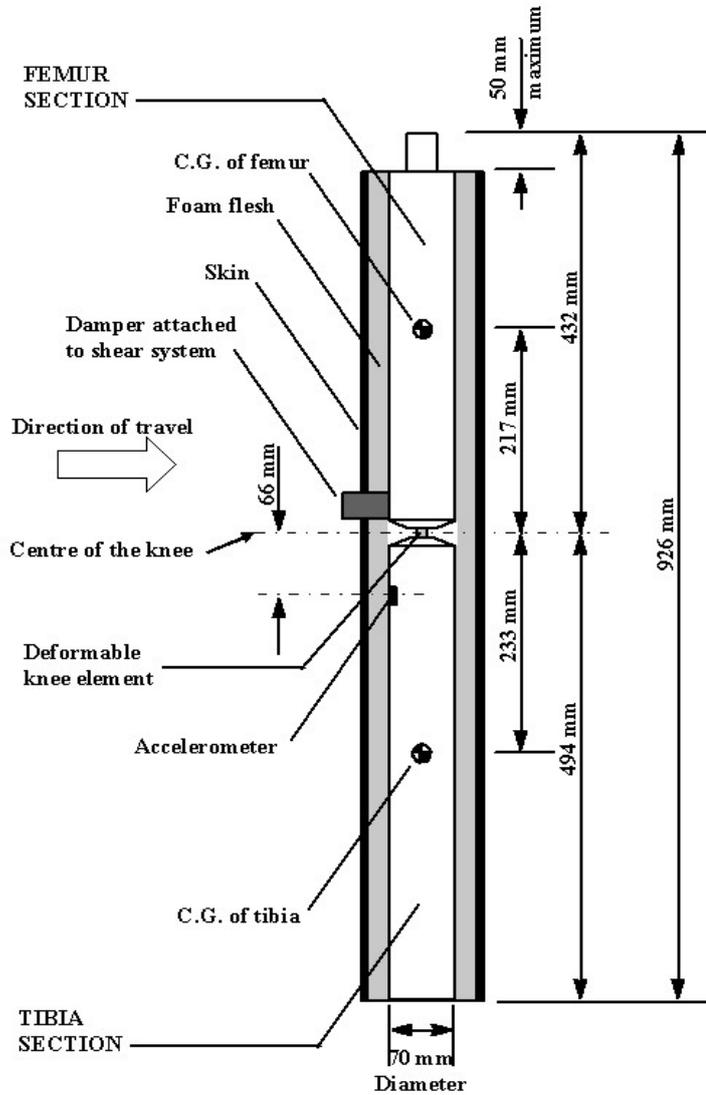
Paragraph 6.1.1., correct to read:

^{1/} A contracting party may restrict application of the requirements in its domestic legislation if it decides that such restriction is appropriate.

"6.1.1.stabilized temperature of $20 \pm 4^{\circ}\text{C}$."

...

Figure 12, amend to read:



Paragraph 6.3.1.2.7., amend to read:

"6.3.1.2.7. For each.... rubber sheet. The mass of the foam and the rubber skin together shall be 0.6 ± 0.1 kg...."

Paragraph 6.3.1.2.9.1., figure 13, correct the words "Weight as required" to read "Mass as required"

Paragraph 6.3.2.1., amend to read:

"6.3.2.1. Child headform impactor (see Figure 14)

.....The overall diameter shall be 165 ± 1 mm. The mass shall be $[3.5 \pm 0.07$ kg]...."

Paragraph 7.1.1.3. and Figure 17, correct the words "reference level" to read "reference plane" 3 times

Paragraph 7.1.2.2., amend to read:

"7.1.2.2.

At the time of first contact, the impactor horizontal centre line

...with a ± 10 mm tolerance and the impactor vertical centre line shall be positioned laterally with"

Paragraph 7.2.2., correct "to give the velocity" to read "to determine the velocity".

Paragraph 7.3.4., amend to read:

"7.3.4. The headform velocity at the time of impact shall be $[9.7 \pm 0.2$ m/s]."

Paragraph 7.4.4., amend to read:

"7.4.4. The headform velocity at the time of impact shall be $[9.7 \pm 0.2$ m/s]."

Paragraph 7.4.5., correct "in the fore and aft vertical" to read "in the longitudinal vertical".

Paragraph 8.1.1.4., amend to read:

"8.1.1.4. The impactor, without foam covering and skin, shall be mounted with the tibia firmly clamped to a fixed horizontal surface and a metal tube connected firmly to the femur, as shown in Figure 20. The rotational axis of impactor knee joint shall be vertical. To avoid friction errors, no support shall be provided to the femur section or the metal tube. The bending moment applied at the centre of the knee joint, due to the mass of the metal tube and other components (excluding the legform itself), shall not exceed 25 Nm.

A horizontal normal force shall be applied to the metal tube at a distance of 2.0 ± 0.01 m from the centre of the knee joint and the resulting angle of knee deflection shall be recorded. The load shall be increased at a rate between 1.0 and 10°/s until the angle of deflection of the knee is in excess of 22°. Brief excursions from these limits due, for instance, to the use of a hand-pump shall be permitted.

The energy is calculated by integrating the force with respect to the bending angle in radians, and multiplying by the lever length of 2.0 ± 0.01 m."

Paragraph 8.1.1.5., amend to read:

"8.1.1.5. The impactor, without foam covering and skin, shall be mounted with the tibia firmly clamped to a fixed horizontal surface and a metal tube connected firmly to the femur and restrained at 2.0 m from the centre of the knee joint, as shown in Figure 21.

A horizontal normal force shall be applied to the femur at a distance of 50 mm from the centre of the knee joint and the resulting knee shearing displacement shall be recorded.

The load shall be increased between 0.1 and 20 mm/s until the shearing displacement of the knee is in excess of 7.0 mm or the load is in excess of 6.0 kN. Brief excursions from these limits due, for instance, to the use of a hand-pump shall be permitted."

Paragraph 8.2.4.3., correct "extra weight" to read "extra masses".

Paragraph 8.3.3.2., correct "over 300 mm square" to read "over 300 x 300 mm square".

Figures 22 and 23, correct the references to paragraphs "8.1.2.5.1." and "8.1.2.5.2." to read "8.1.2.4.1." respectively "8.1.2.4.2.".
