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agenda item B.1.7.)

PROPOSAL FOR DRAFT AMENDMENTS TO REGULATION No. 16
(Safety-belts)

Transmitted by the expert from France on behalf of the ad hoc group

Note: The text reproduced below was prepared by an ad hoc group in order to authorize the use of an acceleration test device for validation of the dynamic behaviour of a safety-belt.

New text is **bolded and underlined**, and existing text to be deleted is ~~crossed through~~.

Note: This document is distributed to the Experts on Passive Safety only.

A. PROPOSAL

CONTENTS, Annex 8, amend to read.

"Annex 8 - Description of curve of trolley's deceleration **or acceleration** as a function of time"

THE TEXT OF THE REGULATION,

Paragraph 7.7.4., amend to read:

"7.7.4. **Deceleration or acceleration devices**

The applicant shall choose to use one of the two following devices:

7.7.4.1. Deceleration test device

The trolley shall be so propelled that at the moment of impact its free running speed is 50 km/h \pm 1 km/h and the manikin remains stable. The stopping distance of the trolley shall be 40 cm \pm 5 cm. The trolley shall remain horizontal throughout deceleration. The deceleration of the trolley shall be achieved by using the apparatus described in annex 6 to this Regulation or any other device giving equivalent results. This apparatus shall comply with the performance **hereafter specified:**

The deceleration curve of the trolley, weighted with inert mass to produce a total mass of 455 kg \pm 20 kg for safety-belts tests and 910 kg \pm 40 kg for restraining systems tests where the nominal mass of the trolley and vehicle structure is 800 kg, must remain within the hatched area **of the graph in annex 8**. If necessary, the nominal mass of the trolley and attached vehicle structure can be increased by increments of 200 kg, in which case, an additional inert mass of 28 kg per increment shall be added. In no case shall the total mass of the trolley and vehicle structure and inert masses differ from the nominal value for calibration tests by more than \pm 40 kg. During calibration of the stopping device, the speed of the trolley shall be 50 km/h \pm 1 km/h and the stopping distance shall be of 40 cm \pm 2 cm.

7.7.4.2. Acceleration test device

The trolley shall be so propelled that, during the test, its total velocity change ΔV is [51 km/h $\begin{smallmatrix} +2 \\ -0 \end{smallmatrix}$ km/h] and its acceleration curve is within the hatched area of the graph in annex 8, and stay above the segment defined by the coordinates [10g, 5ms] and [20g, 10ms]. The trolley shall remain horizontal during the acceleration. The distance to achieve the first [50 km/h $\begin{smallmatrix} +1 \\ -0 \end{smallmatrix}$ km/h] of the velocity change of the trolley shall be of [40 cm \pm 5 cm]. The start of the impact (T0) is defined, according to ISO DIS 17 373 for a level of acceleration of 0.5 g.

Despite the fulfilment of the above requirements, the technical service shall use a mass of trolley (equipped with its seat), as specified in paragraph 1 of annex 6, superior to 380 kg."

Paragraph 7.7.5., amend to read:

"7.7.5. The trolley speed immediately before impact (**only for deceleration sleds, needed for stopping distance calculation**), **the trolley acceleration or deceleration**, the forward displacement of the manikin and the speed of the chest at a 300 mm displacement of the chest shall be measured.
The velocity change will be calculated by integration of the recorded sled acceleration or deceleration.
The distance to achieve the first $[50 \text{ km/h} \begin{smallmatrix} +1 \\ -0 \end{smallmatrix} \text{ km/h}]$ of the velocity change of the trolley may be calculated by double integration of the recorded sled acceleration or deceleration."

Paragraph 7.10.1., amend to read:

"7.10.1. The test report shall record :

- the results of all the tests in paragraph 7. above and in particular:
- **the type of device used for the test (acceleration or deceleration device),**
- **the total velocity change,**
- the trolley speed **immediately before impact only for deceleration sleds,**
- **the acceleration or deceleration curve during all the velocity change of the trolley,**
- the maximum forward displacement of the manikin,
- the place - if it can be varied - occupied by the buckle during the test,
- the buckle-opening force,
- any failure or breakage.

If by virtue of paragraph 7.7.1. the anchorages prescribed in annex 6 to this Regulation have not been respected, the test report shall describe how the belt assembly or the restraint system was installed and shall specify important angles and dimensions.

The report shall also mention any distortion or breakage of the buckle that has occurred during the test. In the case of a restraint system the test report shall also specify the manner of attaching the vehicle structure to the trolley, the position of the seats, and the inclination of the seat backs. If the forward displacement of the manikin has exceeded the values prescribed in paragraph 6.4.1.3.2. above, the report shall state whether the requirements of paragraph 6.4.1.4.1. have been met."

Annex 1B, insert a new item 11. to read:

"11. Type of device: deceleration/acceleration 2/

Items 11. to 16. (former), renumber as **12. to 17.**

Annex 8, amend to read:

"Annex 8

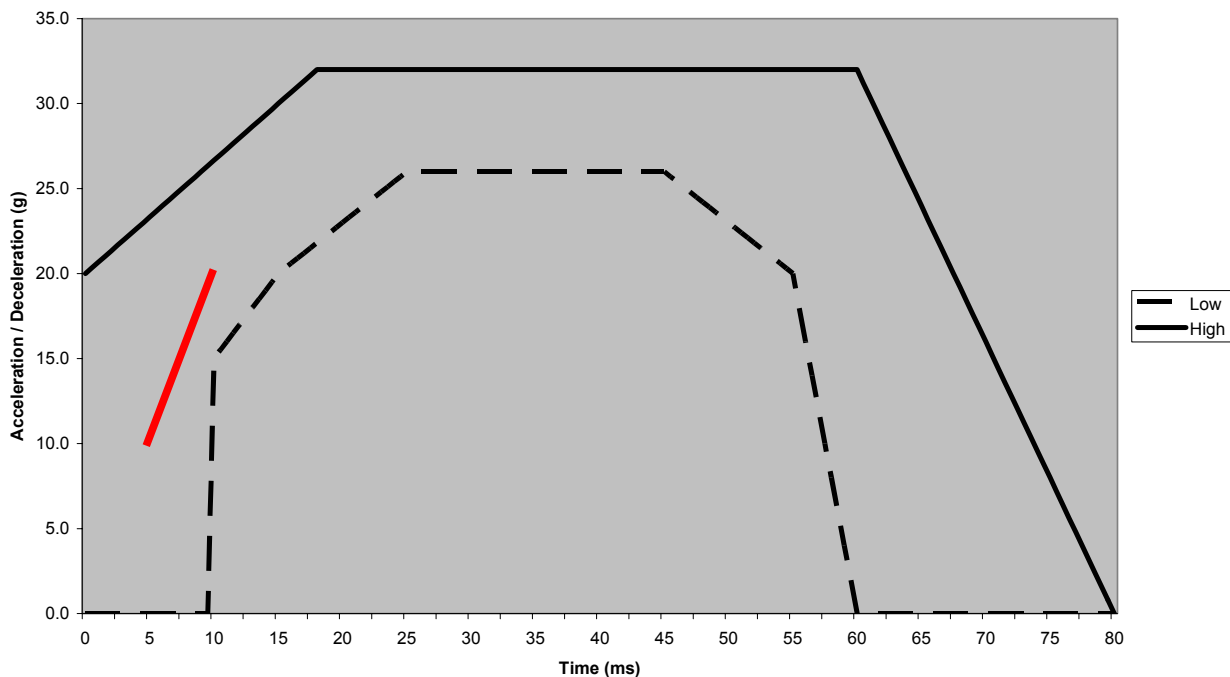
DESCRIPTION OF CURVE OF TROLLEY' S, DECELERATION **OR ACCELERATION**,
AS FUNCTION OF TIME
(~~Curve for testing stopping devices~~)

In all cases the calibration and measuring procedures shall correspond to those defined in the International Standard ISO 6487 (1980); the measuring equipment shall correspond to the specification of a data channel with a channel frequency class (CFC) 60.

Definition of the different curves

Time (ms)	Acceleration (g) Low corridor	Acceleration (g) High corridor
0	-	20
10	0	-
10	15	-
15	20	-
18	-	32
25	26	-
45	26	-
55	20	-
60	0	32
80	-	0

ECE R16



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B. JUSTIFICATION

General:

The acceleration test device (called Hyge sled) is precise test equipment capable of reproducing with a very good repeatability the invert acceleration of a deceleration crash pulse.

It was shown by previous studies that even if the two test devices cannot be considered as totally equivalent, the Hyge sled can be used as alternative test equipment.

An ad hoc group has been set up to propose to GRSP alternative test method to be included in ECE R16. As a first step, and to be in line with the current level of severity applied to safety belts and restraint systems, in European or Japanese Technical Services, the total velocity change was set to 51 km/h and a better definition of T0, initial slope of acceleration curve and equivalent stopping distance were included.

Re. Paragraphs 7.7.4.to 7.7.4.2:

The current definition of the trolley and the calibration method remain for the deceleration test device.

An alternative definition of the acceleration test device has been added. The principle of such equipment needs more precise definitions in terms of speed variation and nominal g level instead of impact speed, stopping distance and deceleration pulse corridor.

Re. Paragraphs 7.7.5., 7.10.1. and Annex 1B:

Inclusion in the test report and in the communication, of the type of device (acceleration or deceleration) used during type approval test.

The proposed complement authorizes the use of and acceleration test device for type approval of safety belts and restraint systems.

Re. Annex 8:

Parts of annex 8 have been put in paragraph 7.7.4. in order to use the same annex 8 for the two test devices (acceleration and deceleration).

As it can be seen in the table below, the actual pulse corridor permits a wide range of velocity change if there is no defined impact speed.

It is for that reason that a velocity change of 51 km/h has been defined for the acceleration test device. This variation of speed corresponds to the nominal curve and also to actual variation of speed on deceleration test devices including impact speed plus rebound speed.

Calculation of velocities

Curve	Velocity (km/h)
Low corridor	39.46
High corridor	75.29
Nominal curve	55.47
