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agenda item B.2.)

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

Transmitted by the expert from the Netherlands

Note: The intention of this amendment is to propose the total velocity change ΔV (calculated by integration) as the basis of the dynamic test with acceleration and deceleration sleds in order to avoid problems concerning rebound. A better procedure to control the first gradient of the curve has been added. This includes also the definition of a "time zero" that will count as the start of the impact.

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

This document is distributed according to the request of GRSP (TRANS/WP.29/GRSP/35, para. 30).
It supersedes document TRANS/WP.29/GRSP/2004/18.

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

Acceleration and deceleration test devices

A. PROPOSAL

CONTENTS, Annex 8, amend to read.

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

Paragraph 7.7.4., amend to read:

"7.7.4. The trolley shall then be accelerated or so propelled that and decelerated in such a way that the total velocity change ΔV is $[56 \pm 2 \text{ km/h}]$. At the moment that counts as the start of the impact its free running speed is $50 \text{ km/h} + 1 \text{ km/h}$ and the manikin remains shall be stable. The stopping distance to achieve the first $50 \pm 1 \text{ km/h}$ of the velocity change of the trolley shall be $40 \text{ cm} \pm 5 \text{ cm}$. The trolley shall remain horizontal throughout acceleration or deceleration. The apparatus being the origin for the deceleration of the trolley shall to be achieved by using the apparatus is described in annex 6 to this Regulation however, ~~or~~ any other device giving equivalent results may be used.

This All used apparatus shall comply with the performance specified in annex 8 to this Regulation."

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."

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 velocity change.
- the trolley speed on the moment that counts as the start of the impact ($t=0$), which is defined as the moment that the acceleration or deceleration vs time filtered CFC 60 passes a level of 0.5 G,
- which kind of sled is used (accelerating or decelerating sled), and its
- accelerating or braking mechanism e.g. hydraulic, polyurethane tubes according to annex 6, crumple tubes, deforming metal strips,
- How the prescriptions of annex 8 with regard to the trolley curve are fulfilled, that is to say: or the sled is calibrated with inert mass according to part B, or the curves of the actual dynamic type approval tests fulfil all requirements (see part A),
- legible diagrams showing the acceleration or deceleration curve for sleds that are calibrated with manikin(s),

- 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, and
- 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."

Title of annex 8, amend to read:

"DESCRIPTION OF CURVE OF TROLLEY ACCELERATION OR DECELERATION AS FUNCTION OF TIME
(Curve for Testing Acceleration and Stopping devices)"

Text in annex 8, below figure, amend to read:

"There are two ways for fulfilling the conditions of para. 8.1.3.4. and remaining in the hatched areas of the Appendices to this annex:

[PART A: Each curve of the actual dynamic type approval tests must remain within the hatched area]

PART B: Calibration procedure for sleds that use inert mass during calibration:

The acceleration or deceleration curve of the trolley weighted with inert mass to produce a total mass of $455 \text{ kg} \pm 20 \text{ kg}$ for safety-belt tests and $910 + 40 \text{ kg}$ for restraining system tests where the nominal mass of the trolley and vehicle structure is 800 kg must remain within the hatched area above.

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 $\pm 40 \text{ kg}$.

Both for method A as well as for method B, the gradient of the beginning of the curve of the acceleration or deceleration has to be such that the rise of the value of the G-level from the start of the impact up to 5 ms afterwards shall be at least [10]G, and up to 10 ms after the start of the impact at least [20]G.

During the actual type approval tests (method A) respectively the calibration of the acceleration or stopping device (method B), the speed velocity change of the trolley shall be 50 [56] km/h \pm 1 km/h and the acceleration or stopping distance for the first 50 \pm 1 km/h of the velocity change shall be 40 cm \pm 2 cm.

In ~~both the above~~ 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."

* * *

B. JUSTIFICATION

The apparatus, being the origin for the deceleration as described in annex 6, achieves a stopping distance of the trolley from 50 to 0 km/h in 40 \pm 2 cm and a rebound velocity of 6 km/h.

Therefore, when making use of velocity change, a ΔV of 56 km/h should be the value which provides an equivalent level of kinetic energy between other sleds and the original sled in annex 6.
