



**Economic and Social  
Council**

Distr.  
RESTRICTED

TRANS/WP.29/GRRF/2003/8  
22 November 2002

Original: ENGLISH  
ENGLISH and FRENCH ONLY

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**ECONOMIC COMMISSION FOR EUROPE**

INLAND TRANSPORT COMMITTEE

World Forum for Harmonization of Vehicle Regulations (WP.29)

Working Party on Brakes and Running Gear (GRRF)  
(Fifty-third session, 3-7 February 2003,  
agenda item 1.1.)

PROPOSAL FOR DRAFT AMENDMENTS TO REGULATION No. 13  
(Braking)

Transmitted by the Expert from Germany

Note: The text reproduced below was prepared by the expert from Germany in order to add new requirements for trailers braked by an inertia (overrun) braking system. The proposal makes it clear what is understood by the general brake force distribution requirement of paragraph 5.2.1.7. of the Regulation.

The changes proposed with regard to trailers braked by air (paragraphs 5.1.1 to 5.1.1.3 of annex 10 of the Regulation) are only editorial.

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Note: This document is distributed to the Experts on Brakes and Running Gear only.

## A. PROPOSAL

### Annex 4,

Paragraph 1.3.2., amend to read:

"1.3.2. Behaviour of the vehicle during braking on a road on which adhesion is reduced. The behaviour of vehicles of categories M<sub>1</sub>, M<sub>2</sub>, M<sub>3</sub>, N<sub>1</sub>, N<sub>2</sub>, N<sub>3</sub>, **O<sub>2</sub>**, O<sub>3</sub>, and O<sub>4</sub> on a road on which adhesion is reduced must meet the requirements of annex 10 and/or annex 13 to this Regulation."

### Annex 10,

Paragraph 1.1., amend to read:

"1.1. Vehicles of categories M, N, O<sub>2</sub>, O<sub>3</sub> and O<sub>4</sub> which are not equipped with an anti-lock system as defined in annex 13 to this Regulation shall meet all the requirements of this annex. If ..."

Footnote 5/ to paragraph 3.1.1., amend to read:

"5/ The provisions of paragraphs 3.1.1 **or 5.1.1.** do not affect the requirements of annex 4 to this Regulation relating to the braking performance. However, if, in tests made under the provisions of paragraphs 3.1.1. **or 5.1.1.**, braking performances ...."

Paragraphs 5.1.1 and its sub paragraphs 5.1.1.1 to 5.1.1.3, amend to read:

"5.1.1. For full trailers with two axles (except where the axle spread is less than 2 metres) the following requirements apply:

5.1.1.1. For k values between 0.2 and 0.8: 5/

$$z \geq 0.1 + 0.85 (k - 0.2)$$

5.1.1.2. For all states of load of the vehicle, the adhesion utilization curve of the rear axle shall not be situated above that for the front axle for all braking rates between 0.15 and 0.30. This condition is also considered satisfied if, for braking rates between 0.15 and 0.30, the adhesion utilization curves for each axle are situated between two lines parallel to the line of ideal adhesion utilization given by the equations  $k = z + 0.08$  and  $k = z - 0.08$  as shown in diagram 1B of this annex and the adhesion utilization curve for the rear axle for braking rates  $z \geq 0.3$  complies with the relation

$$z \geq 0.3 + 0.74 (k - 0.38).$$

5.1.1.3. For the verification of the requirements of paragraphs 5.1.1.1 and 5.1.1.2 the procedure should be as that in the provisions of paragraph 3.1.4."

Paragraph 5.1.2., amend to read:

"5.1.2. For full trailers with more than two axles the requirements of paragraph 5.1.1 of this annex shall apply. The requirements of paragraph 5.1.1 of this annex with respect to wheel lock sequence shall be considered to be met if, in the case of braking rates between 0.15 and 0.30, the adhesion utilized by at least one of the front axles is greater than that utilized by at least one of the rear axles."

Add new paragraphs 5.3. to 5.3.3., to read:

"5.3. For full trailers with inertia (overrun) braking system

5.3.1. The requirements according to paragraph 5.1.1. apply also for full trailers with inertia (overrun) braking system.

5.3.2. For full trailers with inertia (overrun) braking system and with more than two axles the requirements according to paragraph 5.1.2. apply.

5.3.3. For the calculation to verify the compliance with the provisions of paragraph 5.1.1.3. the influence of the permissible drawbar force  $D^*$  (paragraph 9.3.1. annex 12) can be ignored."

The heading of "Diagram 1B", amend to read:

"POWER-DRIVEN VEHICLES OTHER THAN THOSE OF CATEGORIES M1 AND N1 AND FULL TRAILERS (see paragraphs 3.1.1., 5.1. and 5.3.)"

\* \* \*

## **B. JUSTIFICATION**

In paragraph 5.2.1.7. of Regulation No. 13, it is required for **all** categories of vehicle that:

**"The service braking system shall act on all wheels of the vehicle and shall distribute its action appropriately among the axles."**

In contrast to other categories of vehicle, however, it is **not** required for **O<sub>2</sub>** trailers in paragraph 1.3.2. of annex 4 of Regulation No. 13 that the brake force distribution be verified in accordance with annex 10.

In the case of full trailers which are braked by an overrun system, it is common today to have a symmetrical distribution of brake force (**1 : 1**) between the front and rear axles.

The figure below shows adhesion utilization curves calculated for a fifth-wheel trailer with symmetrical brake force distribution.

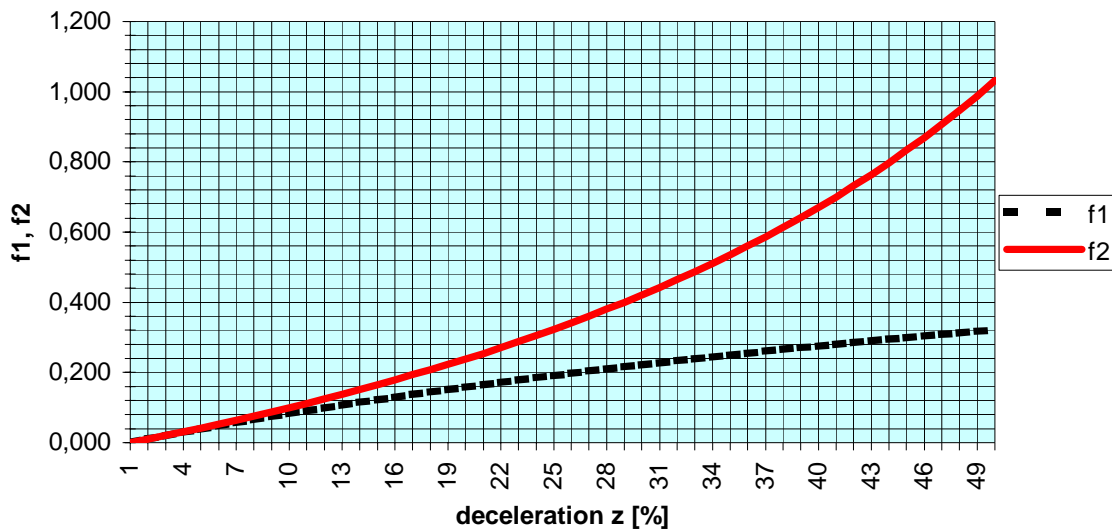
Trailer data:  $P = 3500$  kg (per axle 1750 kg) -  $E = 2.80$  m -  $h_R = 1.5$  m.

In the assessment as to whether a brake force distribution can be deemed appropriate or not (see paragraph 5.2.1.7. of Regulation No. 13 above), there is certainly scope for judgement.

The brake force distribution shown in the figure below, being typical for many full trailers currently on the roads which are braked by an overrun system, the adhesion utilization curve of the rear axle is **above** that of the front axle over the whole deceleration range.

**Figure**

**Utilization curves f1, f2 of inertia braked full trailers**



If, for assessment purposes, one refers to the fundamental requirement of annex 10, "for all states of load of the vehicle, the adhesion utilization curve of the rear axle shall not be situated above that for the front axle", it will certainly not be possible to describe the brake force distribution as "appropriate", if this fundamental requirement is **not fulfilled for any state of load and for any deceleration**.

The vehicle category  $O_2$  normally involves trailers braked by an inertia (overrun) braking system. To complete the picture, however, the present proposal also covers  $O_2$ -category trailers with air brakes. The range of application of paragraph 1.3.2. of annex 4 and of paragraph 1.1. of annex 10 is therefore extended in general (for trailers with overrun and air brakes) to include vehicle category  $O_2$ .

The changes proposed with regard to paragraphs 5.1.1. to 5.1.1.3. are only editorial. In Regulation No. 13, it is common to give a clear description of the special provisions for motor vehicles and trailers. The **general** cross references to motor vehicle provisions are replaced in the newly proposed paragraph 5.1.1. of annex 10 by the provisions which apply specifically to the trailers in question.