

Regulation No. 13 (Heavy Vehicle Braking)

Proposal for an amendment to Regulation No. 13

The text reproduced below was prepared by the expert from German to supersede documents ECE/TRANS/WP.29/GRRF/2009/28 and ECE/TRANS/WP.29/GRRF/2010/2 to allow O₃ trailers to be type-approved using successful Type-III test results. Modifications to the existing text of the Regulation are marked in **bold** characters.

A. PROPOSAL

Annex 4, item 1.5.2.1., amend to read:

"1.5.2.1. The service brakes of categories O₂ and O₃ (**when the O₃ trailer has not passed alternatively the Type-III test according to paragraph 1.7 of this Annex**) shall be tested..."

Annex 4, item 1.7., amend to read:

"1.7. Type-III test (fade test for vehicles of category O₄ **or alternatively of category O₃**)"

Annex 4, items 3.1.2.4. and 3.1.2.5., amend to read:

"3.1.2.4. In addition, the vehicles shall undergo the Type-I test **or alternatively a Type-III test in the case of an O₃ trailer.**

3.1.2.5. In the Type-I **or the Type-III** test of a semi-trailer, the mass braked by the latter's axle(s) must correspond to the maximum axle load(s) (not including the king pin load)."

Annex 11, Appendix 3, items 2.3.1. and 2.3.2., amend to read:

"2.3.1. In the case of vehicles of categories O₂ and O₃ **where the O₃ trailer has been subject to the Type I test:**

2.3.2. In the case of vehicles of **categories O₃ and O₄ where the O₃ trailer has been subject to the Type III test:**"

B JUSTIFICATION

At the 66th GRRF a final decision about the German proposal was postponed. The aim of this extended justification is to give further technical information about the nature of the two fade tests for trailers.

The proposal provides an alternative, and thereby a simplification, for one of the requirements an O₃ trailer has to meet to be type-approved.

Currently, if the same axle is used in both O₃ and O₄ trailers (depending on the number of axles used) it will be tested to both the Type-I (O₃ trailer) and the Type-III (O₄ trailer) requirements.

Therefore, it is proposed to allow a Type-III test result to be also used for an O₃ trailer type-approval.

Especially for trailers which are de-rated with respect to their GVW to change the vehicle category from O₄ to O₃ (e.g. for reason of vehicle tax and driving license regulation) no additional type-I test has to be carried out anymore.

The Type-I test and Type-III tests are addressed in the following paragraphs of ECE-R13.

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|-----------------------------------|---|
| -Type-I (with continuous braking) | see Annex 4 paragraph 1.5.2, Annex 11 paragraph 3.5.2, Annex 12 paragraph 7.5, Annex 15 paragraph 4.4 |
| -Type-III (with repeated braking) | see Annex 4 paragraph 1.7, Annex 11 paragraph 3.5.3, Annex 15 paragraph 4.6 |

The Type-III test was introduced after more than five years of discussions within the GRRF to improve the braking balance between the towing vehicle and trailer. This change provided better compatibility and the use of similar lining qualities for both the towing vehicle and trailer to avoid glazing of the friction materials and produce high decelerations when the brakes were in both cold and hot conditions. This test was introduced by ECE-R13, 09 series of amendments (date of entry into force: 01.10.96) and replaced the former Type II test for trailers.

Although the Type-III test is regarded as more stringent as the Type-I test it may happen that an axle might pass the Type-III test but not the Type-I test. This is due to the different test conditions of these two tests.

The critical test condition of the Type-I test with continuous braking (O₃ trailers) is that at the end of the hot performance test (see Annex 4, paragraph 1.5.3 or Annex 11, paragraph 3.5.2.4)

the sp-value (effective stroke 'sp', see A19, Appendix 7) must be such that an axle can pass the verification calculation of the hot performance according to Annex 11, Appendix 2, paragraph 4.3 during the type approval procedure.

The critical test conditions of the Type-III test with repeated braking (O₄ trailers) are:

- Hot performance (see Annex 4, paragraph 1.7.2)
- sp-value (see Annex 11 Appendix 2, paragraph 4.3.1.1)
- Free running tests (see Annex 4, paragraph 1.7.3)

From this comparison it is concluded that the Type-III test with repeated braking is more comprehensive in its testing requirements than the Type-I test with continuous braking (O₃ trailers).

For all motor vehicles the Type-I test only with repeated braking is prescribed. This test is similar to the Type-III test for trailers in contrast to the Type-I test with continuous baking for trailers.

The test procedure with repeated braking is seen as more representing of the real driving situation as the O₃ trailer fade test Type-I with a continuous baking effort.

Therefore Germany proposes that the Type-III test may replace the Type-I test in the case of O₃ trailers.

In the following a comparison calculation of the braking energy during the two trailer fade test are shown.

Type	Trailer – Fading tests	
	I	III
GVW	< 10t	> 10t
Type of test	1 brake application	20 brake applications
Test conditions	1.7 km	from 60 to 30 km/h
	6% Deceleration	30% Deceleration
	2.55 min	20 min
Energy absorbed per wheel	4.5 MJ	9.4 MJ
Hot performance requirement	36%	40%

Absorbed energy calculations	
Type I	$W = F \cdot s = 4,5 \text{ t} \cdot 9,81 \frac{\text{m}}{\text{s}^2} \cdot 0,06 \cdot 1,7 \text{ km} = 4,5 \text{ MJ}$
Type III	$W = \frac{1}{2} \cdot m \cdot (v_1^2 - v_2^2) = 20 \cdot \frac{1}{2} \cdot 4,5 \text{ t} \cdot \left(\left(\frac{60}{3,6} \right)^2 - \left(\frac{30}{3,6} \right)^2 \right) \frac{\text{m}^2}{\text{s}^2} = 9,4 \text{ MJ}$
