Transmitted by the expert from the United Kingdom

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agenda item 3(h))

PROPOSAL FOR DRAFT AMENDMENT TO REGULATION No. 13
(M, N AND O BRAKING SYSTEMS)

A. PROPOSAL

Annex 12,

Insert a new paragraph 2.6. to read:

"2.6. Symbols valid for simulated gradient parking brake force differential

2.6.1. x: Width of track

2.6.2. y: Distance from the tow hitch to centreline of the axle, or the centreline of the axles if two are fitted, or the centreline of the middle axle if three are fitted.

2.6.3. F_{tb} : Minimum total braking force to hold trailer on 18% gradient.

2.6.4. F_{app} : Minimum application force at tow hitch which has to be resisted by trailer brake."

Insert new paragraphs 8. to 8.4.1. to Annex 12 to read:

"8. Simulated gradient parking brake force differential.

8.1. The trailer shall be tested in its fully laden condition on a level surface.

8.1.1. Position the trailer on a level surface and apply the parking brake with a force not exceeding that specified in annex 4 paragraph 3.2.1.

8.2. Prevent one of the wheels from rotating to ensure that the brakes on only one side of the trailer are forced to operate in the reverse direction (see figure 1 below).

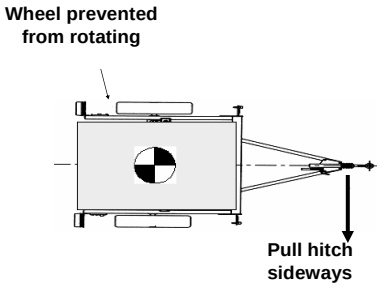


Figure 1. The test layout, showing prevention of wheel rotation and application of side load

Following this test the parking brake should be released and the brakes re-settled prior to repeating the test on the wheel(s) on the other side of the axle(s) with the test layout requirements reversed.

8.2.1. Any resistance from the jockey wheel shall be removed as far as is practicable and he minimum load as calculated in paragraph 8.4. is applied at 90^{O} to the tow-hitch in the direction opposite from the side of the trailer to where the wheel(s) are prevented from rotating.

8.3. The load is increased until the trailer starts to rotate or the minimum force is reached. The method of applying the load to the tow hitch must ensure that there is no reduction in the gradient simulation force, even when the trailer begins to move. The limited movement typically 50mm associated with the operation of the auto-reverse mechanism is ignored in this respect.

8.4. Calculation of the minimum required gradient force

8.4.1. Calculate the minimum gradient force F_{app} required at the tow hitch to guarantee adequate performance from each brake.

Figure 2 below shows dimension x (the trailer track) and dimension y (the distance from the tow-hitch to the axle centre line).

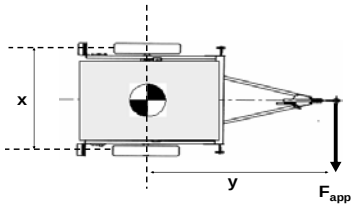


Figure 2. Calculation of relationship between applied side load and brake force

The minimum total brake force F_{tb} (in Newtons) to hold the trailer on an 18% slope is defined by the following equation.

$$Ftb = 0.18 \cdot 9.81 \cdot G_A$$

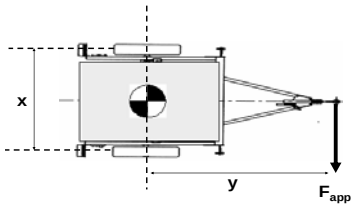
where m is the mass in kg. For the purposes of this test, it is assumed that 50% of this force should be provided by each brake. The minimum applied force (F_{app}) that has to be resisted by the trailer brake is defined by the following formula:

$$Fapp = \frac{x \cdot Ftb}{2 \cdot y}$$

Former paragraphs 8 - 10 renumber 9 - 11.

Annex 12 Appendix 1, add new figure 9 to read:

"Figure 9: Parking brake gradient check
(See paragraph 2., 2.6. and 8 of this annex)



$$Ftb = 0.18 \cdot 9.81 \cdot G_A \qquad Fapp = \frac{x \cdot Ftb}{2 \cdot y}$$ "

Annex 12 Appendix 4

TEST REPORT ON THE COMPATIBILITY OF THE INERTIA BRAKE CONTROL DEVICE, THE TRANSMISSION AND THE BRAKES ON THE TRAILER

Add new paragraphs to read:

"5.8.7. Minimum calculated parking brake force to hold on trailer 18% gradient
$Ftb = 0.18 \cdot 9.81 \cdot G_A$ ……..N.

5.8.8. Minimum calculated force applied at tow hitch to confirm simulated 18% gradient performance of individual parking brakes
$Fapp = \frac{x \cdot Ftb}{2 \cdot y}$ ……N.

Amend paragraph 6 to read:

"6. The inertia braking system described above complies/does not comply 1/ with the requirements of paragraphs ~~3~~. **4.** to ~~9.~~ **10.** of this annex.

Signature …… Date ……

B. JUSTIFICATION

The general requirements of this Annex 12, specifically paragraph 3.5. states that auto-reverse devices should not adversely affect the parking brake performance when facing up a gradient. However, the current approval test for an inertia braking system does not completely assess the parking brake system to ensure that the brakes on each side are capable of providing their appropriate share of the braking force required to hold the trailer on an 18% gradient.

The design of the auto-reverse mechanism includes a small hump in the profile of the shoe web. This feature is designed to prevent unnecessary operation of the auto-reverse function during normal forward driving (such as when shunt occurs between the vehicle and trailer). This means that there is a small threshold to overcome to initially invoke the mechanism. Once the hump is passed, there is a reduction in the level of force required to maintain the auto-reverse function, however providing both brakes go into auto-reverse mode together the brake force available is sufficient to hold the trailer on the 18% gradient.

Problems arise when the geometry of the compensator permits only one brake to go into auto-reverse mode leaving the other brake to contribute little or no braking effort. The resultant cause is that the trailer can pivot around the one locked wheel. This proposed simple physical test will ensure that both each brake will contribute sufficient force to ensure that it remains stable even when subjected to side forces.

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