Transmitted by the expert from the United Kingdom

Informal Document No. **GRRF-66-23**

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The text reproduced below was prepared by the expert from the United Kingdom to insert into Regulation No. 13 a calculation method to ensure that the parking brake(s) on each side of the axle(s) are capable of providing their appropriate share of the braking force required to hold the trailer on an 18 per cent gradient. The modifications to the existing text of the Regulation are marked in **bold** characters.

A. PROPOSAL

Annex 12

Insert new paragraphs 2.3.10. to 2.3.12., to read:

"**2. SYMBOLS AND DEFINITIONS**

2.3.10. **s_{cf} : Rear cable or rod travel at compensator when brakes operate in forward direction 1/**

2.3.11. **s_{cr} : Rear cable or rod travel at compensator when brakes operate in rearward direction 1/**

2.3.12. **s_{cd} : Differential travel at compensator when only one brake operates in the forward direction and the other in the reverse direction 1/**

Where: $s_{cd} = s_{cr} - s_{cf}$ **(see figure 5A Appendix 1)**"

Amend paragraph 3.1., to read:

"**3.1.** **…... this part shall be as short as possible. The control rods and cables shall not contact the trailer frame or other surfaces that may affect the application or release of the brake**."

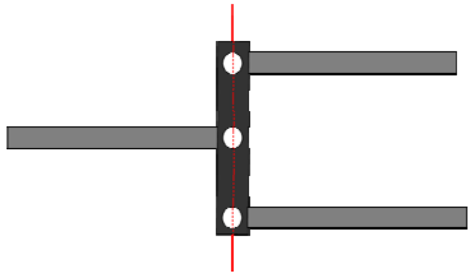
Insert new paragraphs 8. to 8.1.2., to read:

"**8. SIMULATED GRADIENT PARKING BRAKE FORCE DIFFERENTIAL**

8.1. Calculation method

1/ **Paragraphs 2.3.10., 2.3.11. and 2.3.12. only apply to the parking brake differential travel calculation method.**

8.1.1. The pivot points in the compensator shall lie in a straight line with the park brake at the rest position.



All compensator pivots to be in-line

Alternative arrangements can be used, if they provide equal tension in both rear cables, even when there are differences in travel between the rear cables.

8.1.2. Drawing details are to be provided to demonstrate that the compensator articulation is sufficient to ensure equal cable tension is applied to each of the rear cables. The compensator needs to have sufficient distance across the width to facilitate the differential travels left to right. The jaws of the yolks also need to be deep enough relative to their width to make sure that they do not prevent articulation when the compensator is at an angle.

Differential travel at compensator (s_{cd}) shall be derived from:

$$s_{cd} \geq 1.2 \cdot (S_{cr} - S_c')$$

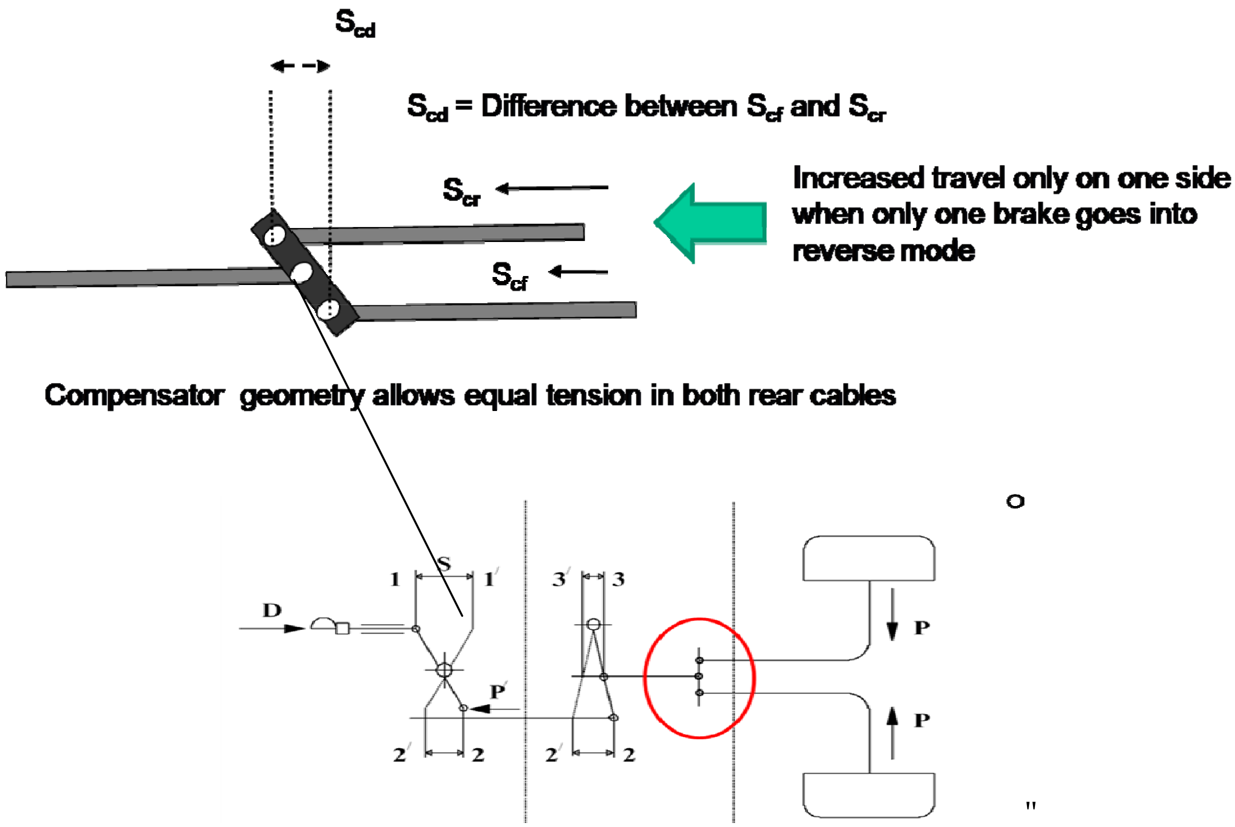
Where:

$S_c' = S'/i_H$ (travel at compensator - forward operation) and $S_{c'} = 2 \cdot S_B/i_g$
$S_{cr} = S_r/i_H$ (travel at compensator - rearward operation)"

<u>Paragraphs 8. to 10. (former)</u>, renumber as paragraphs 9. to 11.

Appendix 1, insert a new figure 5A, to read:

"**Figure 5A: MECHANICAL-TRANSMISSION BRAKING SYSTEM**
(See paragraph 2.3. of this annex)



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Annex 12, Appendix 4

Insert new paragraphs 6. to 6.1.3., to read:

" **6.** **Differential travel at park brake compensator**

6.1.1. **Maximum permissible compensator travel (forward)** s_{cf} = ... **mm**

6.1.2. **Maximum permissible compensator travel (rearward)** s_{cr} = ... **mm**

6.1.3. **Maximum permissible differential compensator travel** s_{cd} = ... **mm**"

Paragraph 6. (former), renumber as paragraph 7. and amend to read:

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

Signature ………………………. Date ……………………………"

Paragraph 8. (former), renumber as paragraph 9.

B. JUSTIFICATION

This proposal outlines a simulated gradient test procedure which will confirm that the parking brake system will apply appropriate forces to either side.

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 per cent 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 calculation method will ensure that each brake will contribute sufficient force to ensure that it remains stable even when subjected to side forces.

It is possible for a trailer braking system to comply with Annex 12, but to fail to operate correctly under certain circumstances. If the compensator is not designed correctly, then most or all of the tension is taken by only one of the rear cables and the other brake is no longer properly applied.

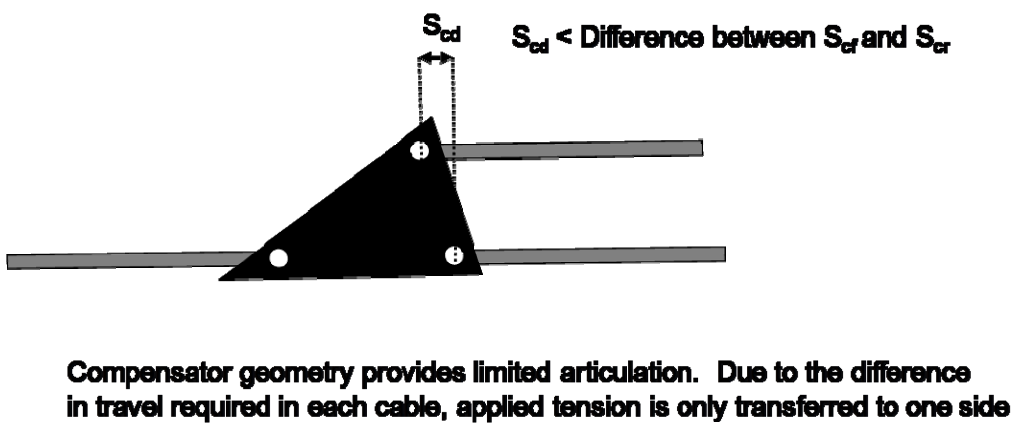

Figure 1: Inappropriate design of compensator

If the compensator design includes appropriate geometry, then both cables are subject to the same tension. Figure 2 shows the park brake operation of the compensator under various situations.

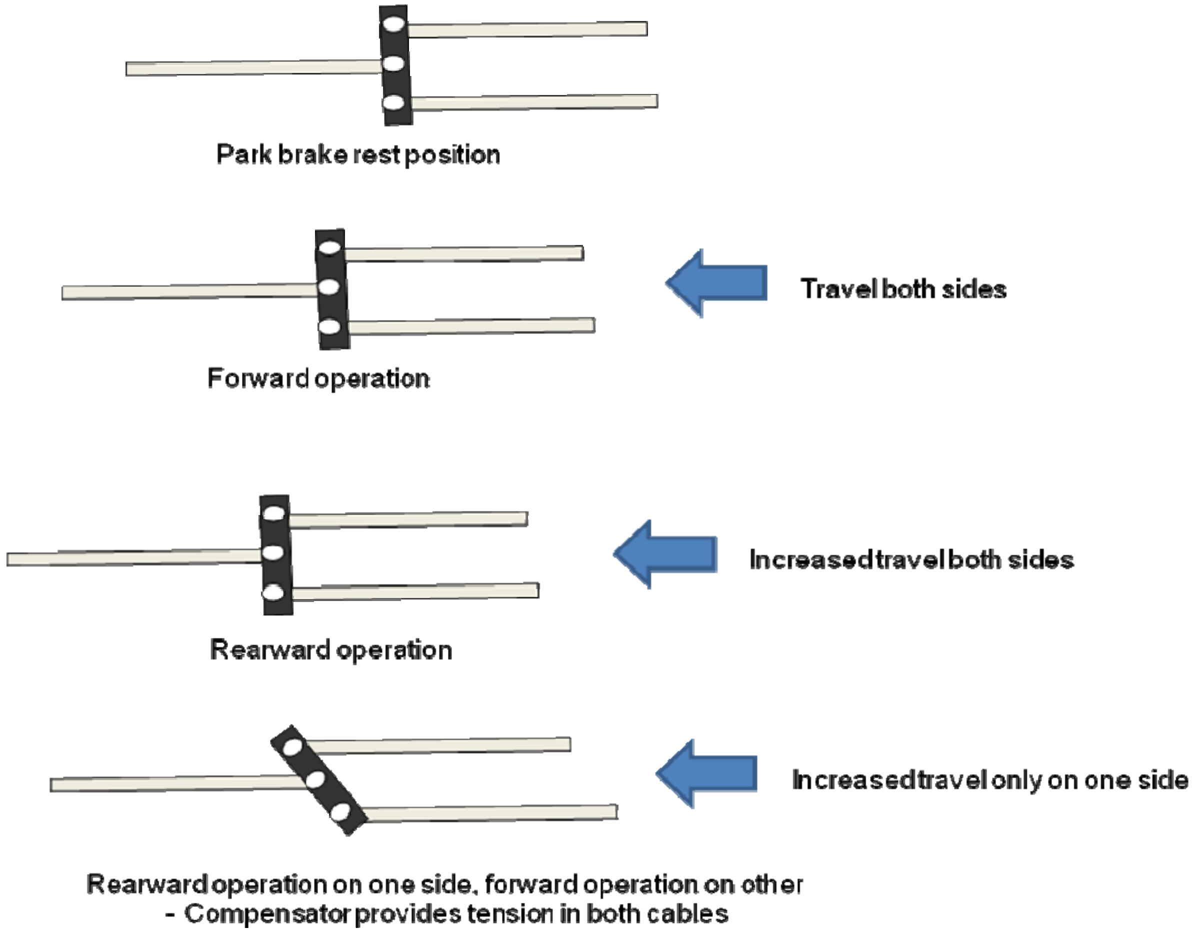

Figure 2: Compensator operation

When the park brake is applied, the compensator applies tension to both rear cables. The compensator normally operates with either both brakes working in the forward or both in the reverse direction. However, if one wheel is stopped from moving by an external force (e.g. held against the kerb), then one brake can remain in the forward operating direction and the other will move into the reverse mode. This results in different travels in the left and right cables. The compensator must tilt to ensure that both cables are still held under the appropriate tension. This is shown in the last diagram in Figure 2.

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