

Comments on Changes to the Requirements Associated with Braking Compatibility of Towing Vehicles and Trailers as Proposed by Denmark in ECE/TRANS/WP29/GRRF/2012/12

Introduction:

At the 71st GRRF Denmark submitted Document GRRF-71-19 the content of which has been consolidated into ECE/TRANS/WP29/GRRF/2012/12. For ease of understanding industry comments on the proposal to amend the requirements with respect to the compatibility requirements for towing vehicles and trailers as defined within Annex 10 of ECE Regulation 13 is considered independently.

Discussion:

Much of the justification to amend the compatibility requirements specified within Annex 10 to ECE Regulation 13 is based on the findings of a report issued in October 2005 (referenced in Informal Document GRRF-59-07) which concluded that many heavy commercial vehicles suffered from underperforming brakes. However in the report there are ten reasons listed for the low brake performance:

- S-cam axles in drum brakes not moving freely (low efficiency/servo factor)
- S-cam rollers not moving freely on brake shoes in drum brakes (low efficiency/servo factor)
- brake calipers and brake shoes not moving freely in disc brakes (low efficiency)
- corroded brake discs with reduced contact area
- wrong brake linings
- "sleeping brakes" – glazed brake linings
- worn-down brake linings
- inactive automatic slack adjusters either due to lack of lubrication or due to excess lubrication and detached protection plugs, which gives free access to dirt and water
- incorrectly adjusted load sensing valves
- leaky brake diaphragms

Nine of the above are of a mechanical nature associated with maintenance and one associated with glazed linings.

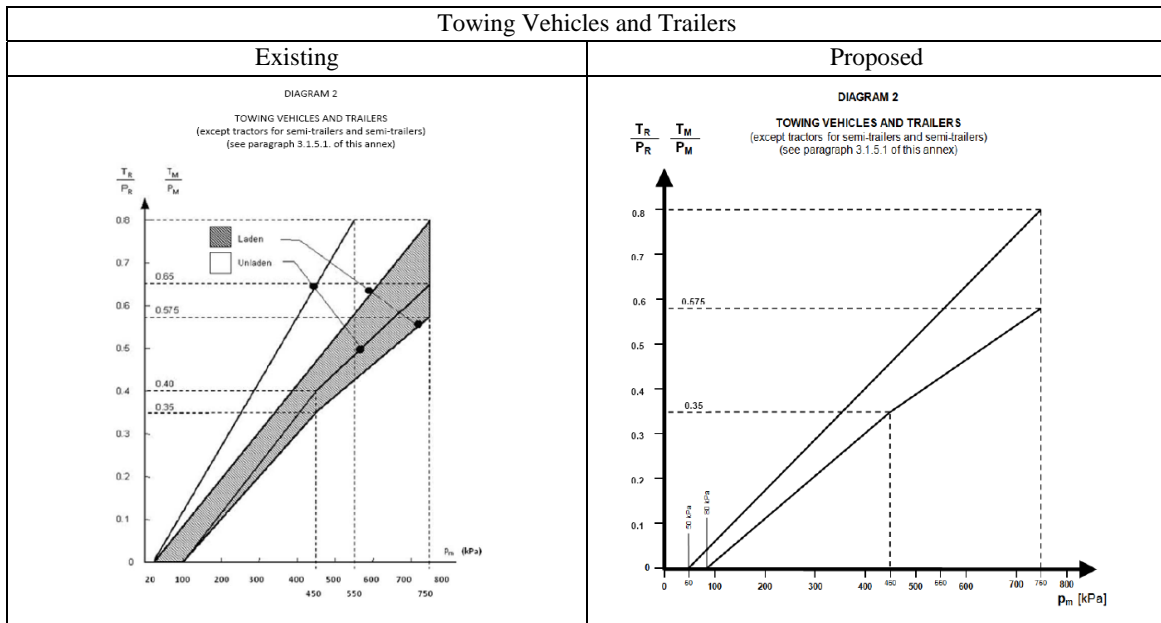
Irrespective of the above the above report does not take into consideration amendments to ECE Regulation 13 that directly impact of the compatibility of towing vehicles and trailers. At the 49th GRRF held in September 2001 the UK presented a report associated with braking compatibility which resulted in informal discussions taking place between industry and the UK. Subsequently the informal group was ratified by WP29 as an official GRRF Informal Group. Discussion continued within the group which included the possibility of reducing the width of the compatibility bands which was subsequently rejected as being impractical. Proposals from the Informal Group were adopted at the 55th Session of GRRF (February 2004) and were introduced as the 10 Series of amendments which became effective in April 2005 and included the following additional requirements:

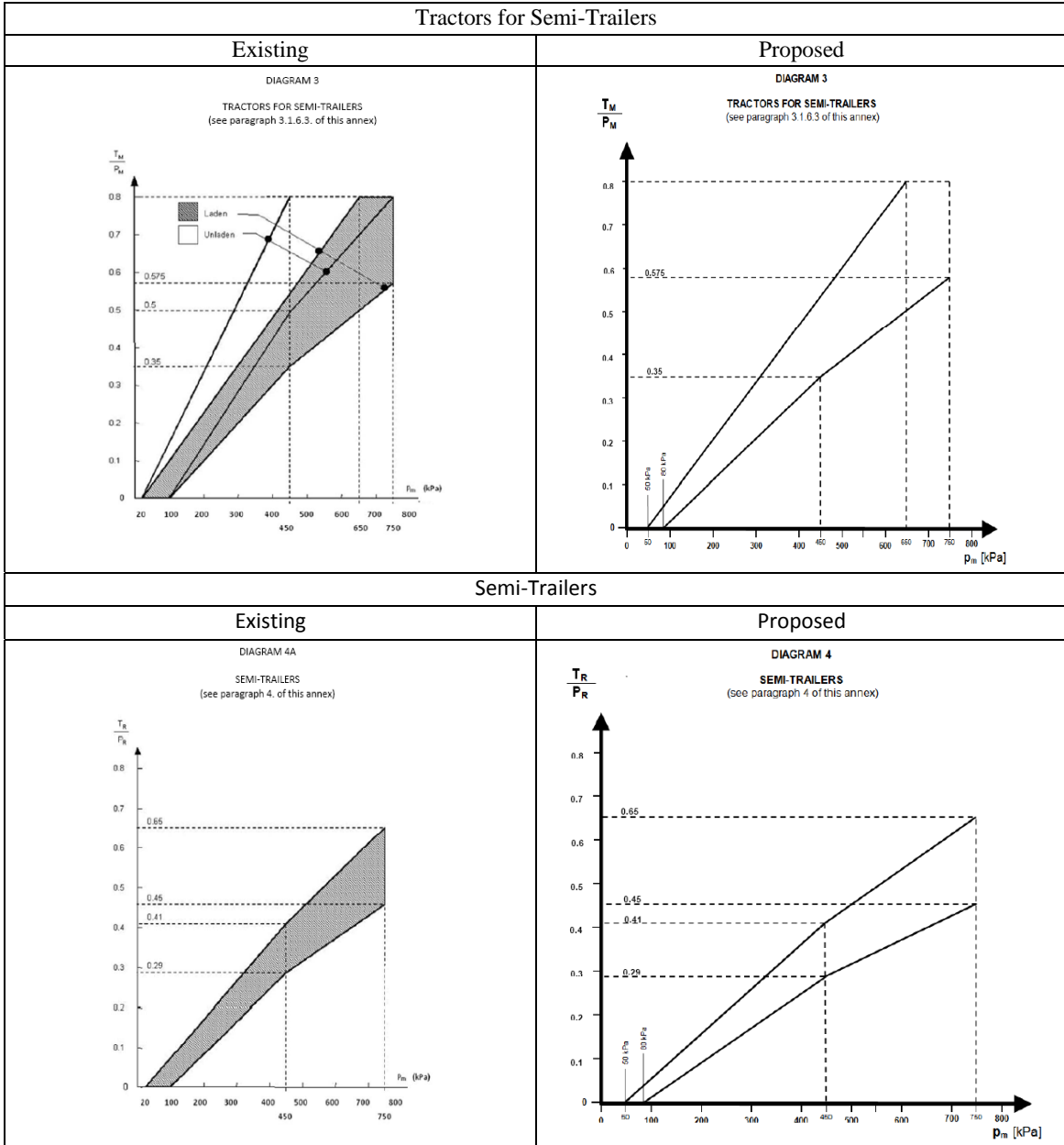
- Requirement to check the functionality of the coupling force control at the time of type approval
- Clarification of the compatibility bands with respect to the requirements below 0.1g and the removal of the ambiguous footnote.
- Requirement for the onset of braking to be physically checked at the time of type approval to ensure braking commenced with the coupling head pressure range 20 to 100kPa. To ensure there was a common procedure to carry out this check a procedure is defined within Annex 10.

As these changes became effective after the report from Denmark was published it is reasonable to assume the impact of these changes have not been taken into consideration.

However as the proposal from Denmark includes a number of proposed amendments that have not previously been considered it is deemed necessary to analyse the content from which the following discussion points are relevant:

The following diagrams illustrate the current requirements and those proposed by Denmark relating to the Annex 10 compatibility bands for the respective vehicles:





In the case of towing vehicles, trailers (including centre axle trailers) and tractors for semi-trailers it is proposed to remove the co-ordinates associated with the unladen bands and, by the amendment proposed for paragraph 1.1 of Annex 13, it would be required to fulfil the laden compatibility band up to a coupling head pressure of 200kPa for all states of load other than laden where the braking performance must be within the band up to a coupling head pressure of 750kPa. Potentially the removal of the unladen compatibility band, which is higher than the laden, will restrict the braking force that can be generated in all conditions other than laden. As it is common for vehicle manufacturers to adhere to the unladen compatibility requirements, even though they are optional, the end result will be reduced braking performance being available. If the braking specification of the current vehicles in service is taken into consideration the operation of these vehicles with a vehicle fulfilling the proposed requirements will be an increase in incompatibility as follows:

Specification of Towing Vehicle	Specification of Trailer	Impact on Vehicle Braking Performance

Existing specification towing vehicle	Proposed specification trailer	Over heating of the brakes of the towing vehicle and potential glazing of the trailer brakes
Proposed specification towing vehicle	Existing specification trailer	Over heating of the brakes of the trailer and potential glazing of the towing vehicle brakes

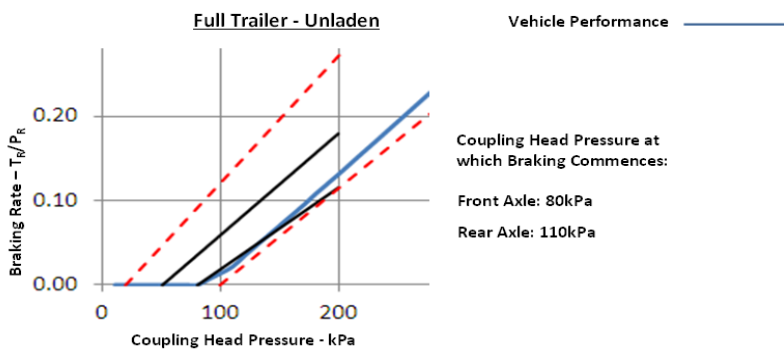
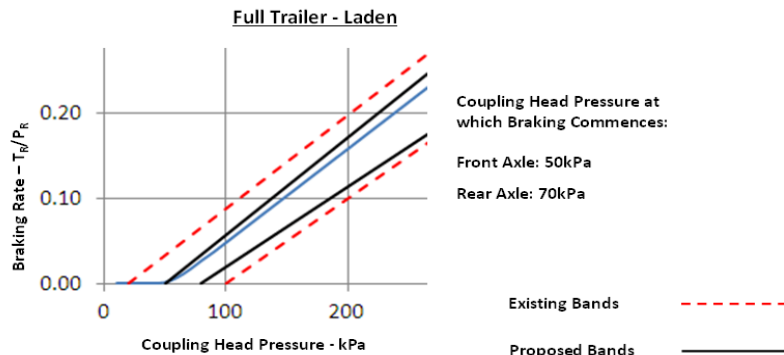
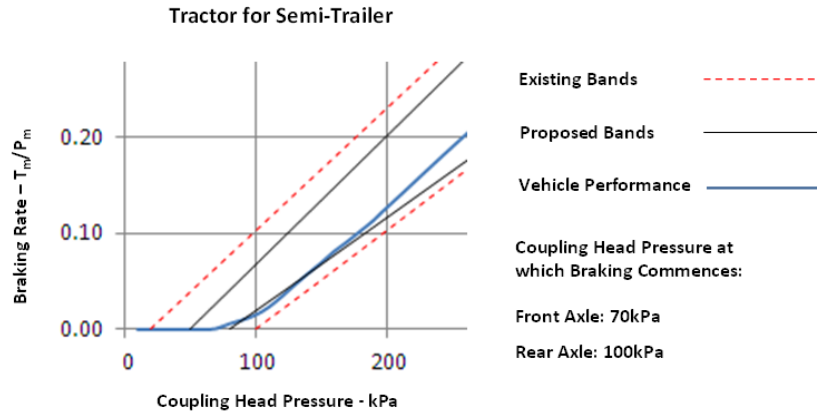
The proposal for the semi-trailer compatibility bands retains the principle of the unladen compatibility bands as there is no suggestion in the proposal to remove the reference to the unladen factor K_v which is used to construct the unladen boundaries. As a result the impact of the compatibility of tractors and semi-trailers will be:

Specification of Tractor	Specification of Semi-Trailer	Impact on Vehicle Braking Performance
Existing specification tractor	Proposed specification semi-trailer	No change in operational characteristics
Proposed specification tractor	Existing specification semi-trailer	Over heating of the brakes of the trailer and potential glazing of the towing vehicle brakes

It is also proposed to reduce the tolerance at which a braking force is first generated relative to coupling head pressure from the current range of 20 to 100kPa to 50 to 80kPa. Justification for this change is based on ISO 20918, (Road vehicles - Braking threshold pressures for heavy commercial vehicle combinations with fully pneumatic braking systems - Test with roller brake tester). This standard is aimed at garages and workshops to adjust the commencement of braking relative to coupling head pressure within a range of 50 to 80kPa. This Standard only relates to setting the point at which braking commences and does not take into consideration that a vehicle manufacturer must ensure the braking performance of a given vehicle lies within at least the laden compatibility bands for all coupling head pressures up to 750kPa. However, within the Scope of the Standard there is the following note:

NOTE: This standard does not cover either high-pressure compatibility or dynamic influences and is not for the use at Type Approval.

In the Informal Group for Braking Compatibility the subject of narrowing the compatibility bands was discussed along with the possibility that the brakes of ALL axles should produce a braking force within the 20 to 100kPa range. Both proposals were rejected on the basis that due to the characteristics of the various valves within a braking system the full range of the compatibility bands is required particularly at lower coupling head pressures when variations in these characteristics are most relevant. This fact is stated in Informal Document GRRF-53-8 presented by the Chairman of the Informal Group at the 53rd GRRF Session. The diagrams below indicate why these proposals are unacceptable:



From the above it can be seen that it is often the case that following the initial generation of a braking force the vehicle performance is not linear, and is the result of the respective axles on the vehicle commencing braking at different coupling head pressures. These characteristics are typical of any conventional pneumatic braking system and could only be overcome by the use of electronic control.

Currently the following limits apply when the check is made, at the time of type approval, to verify when the brakes of a given axle start to generate a braking force relative to coupling head pressure (see paragraph 1.3.1 of Annex 10):

Laden vehicles:

At least one axle shall commence to develop a braking force when the pressure at the coupling head is within the pressure range 20 to 100kPa.

At least one axle of every other axle group shall commence to develop a braking force when the coupling head is at a pressure ≤ 120 kPa.

Unladen Vehicles:

At least one axle shall commence to develop a braking force when the pressure at the coupling head is within the pressure range 20 to 100kPa.

The proposal from Denmark seeks to amend the above to the extent that the brakes on all axles must commence to develop a braking force within the coupling head pressure range of 50 to 80kPa. Included in the diagrams above the values of coupling head pressures when the brakes of each axle commence to develop a braking force are defined. It can be seen that it is not possible to fulfil this proposed requirement with a conventional pneumatic braking system.

Summary:

The following text summarises the above points:

The Danish Study Report from October 2005 does not take into consideration the changes to the compatibility requirements introduced by the 10 Series of Amendments which became effective in April 2005.

Removal of the current unladen compatibility bands for towing vehicles, trailers and tractors for semi-trailers and replace this with having to comply with the laden compatibility bands up to a coupling head pressure of 200kPa is a major change. It is the opinion of industry that this change will increase incompatibility when mixing new vehicles with old.

In the case of semi-trailers there is no reference to removing the unladen compatibility band as the factor K_v remains to enable the co-ordinates of the unladen bands to be calculated. This will result in increased incompatibility as new tractors would be required to fulfil the laden compatibility requirement up to a coupling head pressure of 200kPa.

Reference to ISO20918 is made to justify reducing the coupling head pressure range when a braking force is first generated to 50 to 80kPa. This Standard is specifically applied to vehicles in service and not for the purposes of type approval, which is stated in the scope of the Standard.

Reducing the pressure range when a braking force must be generated narrows the width of the bands at lower coupling head pressures. The current pressure range of 20 to 100kPa is required to enable variations in the braking characteristics of the different axles to be accommodated. Reducing the width of the bands as proposed will effectively mandate electronic braking systems.

Requiring the brakes of all axles to commence to develop a braking force within the coupling head pressure range of 50 to 80kPa cannot be fulfilled for the same reason that the narrowing of the bands cannot be fulfilled. Imposing this requirement would again effectively mandate electronic braking systems.