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Item 4.10.1 of the provisional agenda

1958 Agreement – Consideration of amendments to draft Regulations submitted by GRRF**Proposal for Supplement 9 to the 11 series of amendments to Regulation No. 13 (Heavy vehicles braking)****Submitted by the Working Party on Brakes and Running Gear ***

The text reproduced below was adopted by the Working Party on Brakes and Running Gear (GRRF) at its sixty-ninth session in order to introduce an Alternative Method to assess the vehicle Electronic Vehicle Stability Control system (AMEVSC). It is based on GRRF-69-06-Rev.1, as reproduced in Annex IV to the report (ECE/TRANS/WP.29/GRRF/69, para. 13). It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee (AC.1) for consideration.

* In accordance with the programme of work of the Inland Transport Committee for 2010–2014 (ECE/TRANS/208, para. 106 and ECE/TRANS/2010/8, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

Insert a new paragraph 2.38., to read:

"2.38. "Character of the vehicle" means a descriptive term for a vehicle – tractor for semi-trailer, truck, bus, semi-trailer, full trailer, centre-axle trailer."

Annex 19, amend to read:

"Annex 19

Performance testing of braking system components

Part 1

Performance testing of trailer braking components

1. General

Part 1 defines the test procedures applicable in defining the performance of the following:

...

6.6.1. A test report shall be produced, the content of which shall be at least that defined in Appendix 8 to this Annex.

Part 2

Performance testing of motor vehicle braking components

1. General

Part 2 defines the procedures applicable in defining the performance of the following:

1.1. A vehicle stability function.

1.1.1. General

1.1.1.1. This section defines the procedure of determining the dynamic characteristics of a vehicle equipped with a vehicle stability function as specified in paragraph 5.2.1.32. of this Regulation.

1.1.2. Information document

1.1.2.1. The **vehicle manufacturer /** system manufacturer shall supply the Technical Service with an information document on the vehicle stability control function(s) for which performance verification is required. This document shall contain at least the information defined in Appendix 11 to this annex and shall be attached as an appendix to the test report.

1.1.3. Definition of test vehicle(s)

1.1.3.1. Based on the stability control function(s) and their application(s) defined in the **vehicle manufacturer's /** system manufacturer's information document, the Technical Service shall carry out a vehicle based performance verification. This shall include one or more dynamic manoeuvres as defined

in paragraph 2.1.3. of Annex 21 to this Regulation on a motor vehicle(s) which is representative of the application(s) defined in paragraph 2.1. of the **vehicle manufacturer's** / system manufacturer information document.

1.1.3.2. When selecting the motor vehicles(s) for evaluation, consideration shall also be given to the following:

- (a) Braking system: the braking system of the test vehicle(s) to be evaluated shall comply with all of the relevant requirements of this Regulation;
- (b) Vehicle category – M₂, M₃, N₂, N₃;
- (c) Character of the vehicle;
- (d) Vehicle configuration(s) (e.g. 4x2, 6x2, etc.): each configuration to be evaluated;
- (e) Drive orientation (Left or right hand drive): not a limiting factor – evaluation not required;
- (f) Single front axle steering: not a limiting factor – evaluation not required (see (g) and (h));
- (g) Additional steering axles (e.g. forced steering, self-steering): to be evaluated;
- (h) Steering ratio: to be evaluated – end-of-line programming or self-learning systems not a limiting factor;
- (i) Drive axles: to be taken into consideration with regard to the use (loss) of wheel speed sensing in the determination of vehicle speed;
- (j) Lift axles: lift axle detection / control and lifted condition to be evaluated;
- (k) Engine management: communication compatibility to be evaluated;
- (l) Gearbox type (e.g. manual, automated manual, semi-automatic, automatic): to be evaluated;
- (m) Drive train options (e.g. retarder): to be evaluated;
- (n) Differential type (e.g. standard or self-locking): to be evaluated;
- (o) Differential lock(s) (driver selected): to be evaluated;
- (p) Brake system type (e.g. air over hydraulic, full air): to be evaluated;
- (q) Brake type (disc, drum (single wedge, twin wedge, S-cam)): not a limiting factor, however, should other types become available, then comparative testing may be required;
- (r) Anti-lock braking configurations: to be evaluated;
- (s) Wheelbase: to be evaluated

In the case where vehicles conforming to the minimum and maximum wheelbases as specified in the information document are not available at the time of testing, minimum and maximum wheelbase verification may be carried-out using **vehicle manufacturer** / system manufacturer test data for real vehicles with a wheelbase within 20 per cent of the actual minimum and maximum wheelbase vehicles being tested by the Technical Service;

- (t) Wheel type (single or twin): to be covered in the **system manufacturer's** information document;
- (u) Tyre type (e.g. structure, category of use, size): to be covered in the **system manufacturer's** information document;
- (v) Track width: not a limiting factor – covered by variations in the centre of gravity evaluation;
- (w) Suspension type (e.g. air, mechanical, rubber): to be evaluated;
- (x) Centre of gravity height: to be evaluated

In the case where vehicles conforming to the maximum centre of gravity height as specified in the information document are not available at the time of testing, maximum centre of gravity height verification may be carried-out utilising **vehicle manufacturer / system manufacturer's** test data for real vehicles with a centre of gravity height within +20 percent of the actual maximum centre of gravity height of the vehicles being tested by the Technical Service;

- (y) Lateral acceleration sensor position: installation envelop **as specified by the system manufacturer** to be evaluated;
- (z) Yaw rate sensor position: installation envelop **as specified by the system manufacturer** to be evaluated.

1.1.4. Test schedule

- 1.1.4.1. To evaluate the vehicle stability control function, the tests used shall be agreed upon between the **vehicle manufacturer / system manufacturer** and the Technical Service and shall include conditions, appropriate to the function being evaluated, that would without the intervention of the stability control function result in loss of directional control or roll-over control. The dynamic manoeuvres, test conditions and results shall be included in the test report.

The evaluation shall include the following, as appropriate:

1.1.4.1.1. Additional steering axles:

Evaluate the influence by a comparison of results with the axle in its normal steering mode and with the steering disabled so that it becomes a fixed axle, unless it is an end-of-line programming parameter.

1.1.4.1.2. Steering ratio:

Tests to be carried-out to determine the effectiveness of any end-of-line programming or self learning using a number of vehicles with different steering ratios, or the approval is restricted to the steering ratios actually tested.

1.1.4.1.3. Lift axle:

Tests to be carried-out with the lift axle in the raised and lowered conditions, with position detection and signal transfer being evaluated to establish that the change in wheelbase has been recognized.

1.1.4.1.4. Engine management:

Control of the engine, or any other source(s) of motive power, to be shown to be independent from driver demand.

1.1.4.1.5. Drive train options:

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- The effect of any options to be shown, e.g. retarder management to be independent of the driver in the case of a retarder.
- 1.1.4.1.6. Differential type/differential lock(s):
Effect of self-locking or driver selected locking to be shown, e.g. function maintained, reduced or switched-off.
- 1.1.4.1.7. Anti-lock braking configurations:
Each anti-lock braking configuration shall be tested on at least one vehicle.
If the vehicle stability function is hosted on different systems (e.g. ABS, EBS), tests shall be carried-out on vehicles having the different hosting systems.
- 1.1.4.1.8. Suspension type:
Vehicles shall be selected on the basis of the suspension type (e.g. air, mechanical, rubber) of each axle or axle group.
- 1.1.4.1.9. Centre of gravity height:
Tests shall be carried-out on vehicles where it is possible to adjust the centre of gravity height so as to demonstrate that the roll-over control is able to adapt to changes in the centre of gravity height.
- 1.1.4.1.10. Lateral acceleration sensor position:
The effect of the lateral acceleration sensor being installed in different positions on the same vehicle shall be evaluated to confirm the installation envelop specified by the **vehicle manufacturer** / system manufacturer.
- 1.1.4.1.11. Yaw rate sensor position:
The effect of the yaw rate sensor being installed in different positions on the same vehicle shall be evaluated to confirm the installation envelop specified by the **vehicle manufacturer** / system manufacturer.
- 1.1.4.1.12. Loading:
Vehicles shall be tested in both the laden and unladen/part laden conditions to demonstrate that the vehicle stability function is able to adapt to differing conditions of load.
In the case of a semi-trailer tractor, tests shall be carried-out as follows:
(a) With a coupled semi-trailer, in the laden and unladen/part laden conditions, in which the roll-over control, if fitted, has been disabled.
(b) In the solo condition (without a coupled semi-trailer or imposed load),
(c) With a load simulating the laden condition (without a coupled semi-trailer).
- 1.1.4.2. Evaluation of buses
As an alternative, in the case of buses, trucks having the same braking system type may be used in the evaluation. However, at least one bus shall be included in the testing and the subsequent report.
- 1.1.5. Test report
- 1.1.5.1. A test report shall be produced, the content of which shall be at least that defined in Appendix 12 of this annex.

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Annex 19 - Appendix 7

Vehicle (trailer) stability function information document

...

Annex 19 - Appendix 8

Vehicle (trailer) stability function test report

...

Annex 19 - Appendix 11

Vehicle (motor vehicle) stability function information document

1. General:
 - 1.1. Name of **vehicle manufacturer / system** manufacturer
 - 1.2. System
 - 1.3. System variants
 - 1.4. System options
 - 1.4.1. Control function (directional/roll-over/both) including an explanation of the basic function and/or philosophy of the control
 - 1.5. System configurations (where appropriate)
 - 1.6. System identification including software level identifier
2. Applications:
 - 2.1. List of motor vehicles by description and configuration that are covered by the information document
 - 2.2. Schematic diagrams of the respective configurations installed on the motor vehicles defined in item 2.1. above with consideration given to the following:
 - (a) Lift axles
 - (b) Steering axles
 - (c) Anti-lock braking configurations
 - 2.3. Scope of application with respect to suspension:
 - (a) Air
 - (b) Mechanical
 - (c) Rubber
 - (d) Mixed

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- (e) Anti-roll bar
- 2.4. Additional information (if applicable) to the application of the directional control and roll-over control functions, for example:
- (a) Wheelbase, track, centre of gravity height
 - (b) Wheel type (single or twin) and tyre type (e.g. structure, category of use, size)
 - (c) Gearbox type (e.g. manual, automated manual, semi-automatic, automatic)
 - (d) Drive train options (e.g. retarder)
 - (e) Differential type/differential lock(s) (e.g. standard or self-locking, automatic or driver selected)
 - (f) Management of the engine or any other source(s) of motive power
 - (g) Brake type
3. Component Description:
- 3.1. Sensors external to the controller
- (a) Function
 - (b) Limitations on the location of the sensors
 - (c) Identification (e.g. part numbers)
- 3.2. Controller(s)
- (a) General description and function
 - (b) Functionality of internal sensors (if applicable)
 - (c) Hardware identification (e.g. part numbers)
 - (d) Software identification
 - (e) Limitations on the location of the controller(s)
 - (f) Additional features
- 3.3. Modulators
- (a) General description and function
 - (b) Hardware identification (e.g. part numbers)
 - (c) Software identification (if applicable)
 - (d) Limitations
- 3.4. Electrical Equipment
- (a) Circuit diagrams
 - (b) Powering methods
- 3.5. Pneumatic circuits
- System schematics including anti-lock braking configurations associated with the motor vehicle types defined in item 2.1. of this appendix
- 3.6. Safety aspects of the electronic system in accordance with Annex 18 to this Regulation

- 3.7. Electro-magnetic compatibility
- 3.7.1. Documentation demonstrating compliance with Regulation No. 10 as required by paragraph 5.1.1.4. of this Regulation

Annex 19 - Appendix 12

Vehicle (motor vehicle) stability function test report

Test Report No.:

- 1. Identification:
 - 1.1. Manufacturer of the vehicle stability function (name and address)
 - 1.2. Applicant (if different from the manufacturer)
 - 1.3. Systems
 - 1.3.1. System variants
 - 1.3.2. System options
 - 1.3.2.1. Control functions
- 2. System(s) and installations:
 - 2.1. Anti-lock braking configurations
 - 2.2. Vehicle applications
 - 2.2.1. Vehicle category (e.g. N₂, N₃, etc.)
 - 2.2.2. Character of the vehicle
 - 2.2.3. Vehicle configuration(s) (e.g. 4x2, 6x2, etc.)
 - 2.2.4. End of line programming
 - 2.3. System identification
 - 2.4. Functional description
 - 2.4.1. Directional control
 - 2.4.2. Roll-over control
 - 2.4.3. Low speed operation
 - 2.4.4. Off-road mode
 - 2.4.5. Drive train options
 - 2.5. Components
 - 2.6. Trailer detection and functionality
 - 2.7. Intervention warning
 - 2.8. Failure warning
 - 2.9. Stop lamp illumination
- 3.0. Assessed vehicle variables:
 - 3.1. General
 - 3.2. Brake system type

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- 3.3. Brake type
 - 3.4. Centre of gravity
 - 3.5. Management of the engine or other source(s) of motive power
 - 3.6. Gearbox type
 - 3.7. Installation configurations
 - 3.8. Lift axles
 - 3.9. Effect of load variations
 - 3.9.1. Roll-over control
 - 3.9.2. Directional control
 - 3.10. Steering ratio
 - 3.11. Additional steering or steered axles
 - 3.12. Suspension
 - 3.13. Track width
 - 3.14. Yaw rate and lateral acceleration sensor(s)
 - 3.15. Wheelbase
 - 3.16. Wheel type, tyre type, tyre size
 4. Limits of Installation:
 - 4.1. Suspension type
 - 4.2. Brake type
 - 4.3. Location of Components
 - 4.3.1. Yaw rate and lateral acceleration sensor(s) position
 - 4.4. Anti-lock braking configuration(s)
 - 4.5. Additional steered axle
 - 4.6. Additional recommendations and limitations
 - 4.6.1. Brake system type
 - 4.6.2. Management of the engine or other source(s) of motive power
 - 4.6.3. Lift axles
 5. Test data and results:
 - 5.1. Test vehicle data (including the specification and functionality of any trailer(s) used during the test(s))
 - 5.2. Test surface information
 - 5.2.1. High adhesion surface
 - 5.2.2. Low adhesion surface
 - 5.3. Measurement and data acquisition
 - 5.4. Test conditions and procedures
 - 5.4.1. Vehicle tests
 - 5.4.1.1. Directional control

- 5.4.1.2. Roll-over control
- 5.5. Additional Information
- 5.6. Test results
 - 5.6.1. Vehicle tests
 - 5.6.1.1. Directional control
 - 5.6.1.2. Roll-over control
- 5.7. Assessment in accordance with Annex 18 to this Regulation
- 5.8. Compliance with Regulation No. 10
- 6. Attachments ¹:
- 7. Date of test:
- 8. This test has been carried out and the results reported in accordance with Annex 19, Part 2 to Regulation No. 13 as last amended by the..... series of amendments.
Technical Service ² conducting the test
Signature: Date:
- 9. Approval Authority ²
Signature: Date: "

¹ **Vehicle manufacturer / S**ystem supplier test data in support of the tolerance allowance as specified in paragraphs 1.1.3.2.(s) and 1.1.3.2.(x) of Part 2 to Annex 19 shall be attached.

² To be signed by different persons even when the Technical Service and Approval Authority are the same or alternatively, a separate Approval Authority Authorization is issued with the report.

Annex 21, amend to read:

"Annex 21

Special requirements for vehicles equipped with a vehicle stability function

- 1. General
 - 1.1. This annex defines ... of this Regulation.
 - 1.2. In meeting the requirements of this annex the "other vehicles" as mentioned in paragraphs 2.1.3. and 2.2.3. shall not differ in at least the following essential respects:
 - 1.2.1. The character of the vehicle;
 - 1.2.2. In the case of power-driven vehicles the axle configuration (e.g. 4x2, 6x2, 6x4);
 - 1.2.3. In the case of trailers the number and arrangement of axles;

- 1.2.4. The front axle steering ratio in the case of power-driven vehicles when the vehicle stability function does not include it as a end-of-line programmable feature or as a self-learning feature;
- 1.2.5. Additional steered axles in the case of power-driven, and steered axles in the case of trailers;
- 1.2.6. Lift axles;
- ...

2.1.3. The vehicle stability function shall be demonstrated to the Technical Service by dynamic manoeuvres on one vehicle which has the same vehicle stability function as the vehicle type to be approved. This may be realized by a comparison of results obtained with the vehicle stability function enabled and disabled for a given load condition. As an alternative to carrying-out dynamic manoeuvres for other vehicles and other load conditions, fitted with the same vehicle stability system, the results from actual vehicle tests or computer simulations may be submitted.

As an alternative to the above, a test report conforming to Part 2, Paragraph 1.1. of Annex 19 may be used.

The use of the ... using the selected manoeuvre(s).

...

2.2.3. The vehicle stability function shall be demonstrated to the Technical Service by dynamic manoeuvres on one vehicle which has the same vehicle stability function as the vehicle type to be approved. This may be done by a comparison of results obtained with the vehicle stability function enabled and disabled for a given load condition. As an alternative to carrying-out dynamic manoeuvres for other vehicles and other load conditions, fitted with the same vehicle stability system, the results from actual vehicle tests or computer simulations may be submitted.

As an alternative to the above, a test report conforming to Part 1, Paragraph 6. of Annex 19 may be used.

The use of the ... using the selected manoeuvre(s).

...

Annex 21, Appendix 2, paragraph 2.3., amend to read

"2.3. The simulator shall be deemed to be validated when its output is comparable to the practical test results produced by the same vehicle(s) during the manoeuvre(s) selected from those defined in paragraph 2.1.3. or 2.2.3. of Annex 21, as appropriate.

The simulator shall only be used with regard to features for which a comparison has been made between real vehicle tests and simulator results. The comparisons shall be carried-out in the laden and unladen condition to show the different conditions of load can be adapted to and to confirm the extreme parameters to be simulated, e.g.:

- (a) Vehicle with shortest wheelbase and highest centre of gravity;
- (b) Vehicle with longest wheelbase and highest centre of gravity.

In the case of the steady state circular test the under-steer gradient shall be the means of making the comparison.

In the case of a dynamic manoeuvre, the relationship of activation and sequence of the vehicle stability function in the simulation and in the practical vehicle test shall be the means of making the comparison."

Annex 21, Appendix 3

Insert new paragraphs 2. to 2.5., to read:

- "2. Simulation tool
- 2.1. Simulation method (general description, taking into account the requirements of paragraph 1.1. of Appendix 2 to Annex 21)
- 2.2. Hardware/software in the loop (see paragraph 1.2. of Appendix 2 to Annex 21)
- 2.3. Vehicle loading conditions (see paragraph 1.4 of Appendix 2. to Annex 21)
- 2.4. Validation (see paragraph 2. of Appendix 2 to Annex 21)
- 2.5. Motion variables (see paragraph 2.1. of Appendix 2 to Annex 21)"

Paragraph 2. (former), renumber as paragraph 3.

Paragraph 2.1. (former), renumber as paragraph 3.1. and amend to read:

- "3.1. Character of vehicle (e.g. truck, tractor for semi-trailer, bus, semi-trailer, centre-axle trailer, full trailer)"

Paragraphs 2.2. (former) to 5., renumber as paragraphs 3.2. to 6.
