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agenda item 5.)

PROPOSAL FOR DRAFT AMENDMENT TO REGULATION No. 79

(Steering equipment)

Transmitted by the Expert from Poland

Note: The text reproduced below was prepared by the expert from Poland in order to amend the test procedure and the drive effort evaluation on the steering wheel. This document refers to document TRANS/WP.29/GRRF/2005/5.

Note: This document is distributed to the Experts on Brakes and Running Gear only.

A. PROPOSAL

Insert a new paragraph 6.2.2., to read:

6.2.2. The measurement of the steering effort of vehicles.

The steering effort of vehicle should be determined on the base of the work characteristic of the steering system $F=f(\delta_H)$ expressed by the relationship between the control effort on the steering wheel F and its turn angle δ_H . This relationship should be obtained by the measurement of the force F and the angle δ_H during the determined change of the direction of vehicle driving with the constant speed $V=10$ km/h (Fig. 1).

The start of the measurements and records of the force F and angle δ_H should be followed after the vehicle drove on the circle at the maximum turn of the steering wheel.

Starting from this position the steering wheel should be turn with the constant speed ($d\delta_H/dt$) in opposite direction until it accomplishes the full opposite position.

After the temporary stop of the steering wheel the direction should be changed maintaining the same constant rotary speed to the maximum (original) turn angle.

During these measurements the absolute rotary speed of the steering wheel should be selected from the range between $20^\circ/s$ to $50^\circ/s$ and kept constant in both directions of the steering wheel.

Starting from the max turn of the steering wheel in right direction it should be made at least two measurements and then should be done the same from max turn position in left direction.

Measurements should be made with the intact steering system and system with a failure where is applied the power assisted device. The steering effort is read out from characteristic $F=f(\delta_H)$ as the average value of forces related to the turn angle of the steering wheel when the vehicle is driving into the bend with the outer contour radius $R=12$ or 20 m to right and left direction according to requirements included in the table below. During the measurement of control effort, forces with duration of less than 0.2 records shall not be taken into account.

In table are presented also the required top limits of the steering efforts for individual categories of vehicles.

In the case of the discrepancy of read out average values of the effort in both directions of the steering wheel turn the greater value, as the effort of steering should be taken.

Table

STEERING CONTROL EFFORT REQUIREMENTS

Vehicle Category	INTACT		WITH A FAILURE	
	Maximum effort (daN)	Turning radius (m)	Maximum effort (daN)	Turning radius (m)
M ₁	8	12	15	20
M ₂	15	12	30	20
M ₃	20	12**/	45*/	20
N ₁	15	12	30	20
N ₂	15	12	30	20
N ₃	20	12**/	45*/	20

*/ 50 for rigid vehicles with 2 or more steered axles excluding self tracking equipment

**/ or full lock if 12 m radius is not attainable.

However, the measured steering effort must be not less than 2 daN.

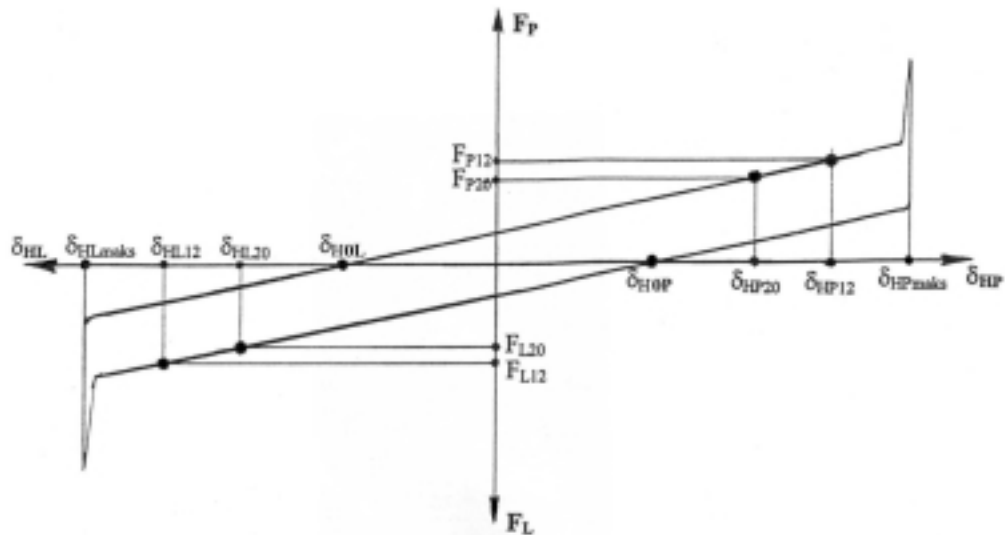


Fig. 1 The example of characteristic of work of the steering system $F=f(\delta_H)$ obtained from measurements during the vehicle driving with the constant speed $v=10$ km/h.

Where:

- $F_{P/L}$ the effort on the steering wheel in right/left directions,
- $\delta_{HP/L}$ the turn angle of the steering wheel in right/left directions,
- $\delta_{HP/Lmax}$ the max turn angle in right/left directions,
- $\delta_{HP/L12}$ the turn angle of the steering wheel during driving of the vehicle into the bend with outer contour of 12 m in right/left direction,
- $\delta_{HP/L20}$ the turn angle of the steering wheel during driving of the vehicle into the bend with outer contour of 20 m in right/left direction,
- $\delta_{H0P/L}$ the turn angle when the effort $F=0$ during the driving out from the bend in right/left directions."

Paragraphs 6.2.3. to 6.2.5.2. (including the table and its corresponding footnotes), should be deleted.

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B. JUSTIFICATION

On the opportunity of the extension of Regulation No. 79 about the requirements for the electronic steering (EST) including the amendments modifying this Regulation we would like to present our suggestions concerning the test procedure and the drive effort evaluation on the steering wheel. We propose to expand the present paragraph .6.2.2. with the sentence:

"This requirement can be formulated in the relationship $\delta_{HOP/L} \leq 0,5 \delta_{HP/Lmax}$ on the base of characteristic of the steering system'" and to renumber it as paragraph 6.2.3.

We propose to delete present paragraphs 6.2.3., 6.2.4. and 6.2.5. and the content of present p.6.2.3. together with methods of measurement and evaluation of the effort on steering wheel we suggest to include in **new paragraph 6.2.2.**

On the bases of our experience we conclude that the time longer than 4 or 6 seconds for the driving into required circle at the speed 10 km/h has not any substantial influence on the value of control effort.

However, it is very important to turn the steering wheel during the whole cycle of the measurement with the constant rotary speed. This speed can be maintained in relatively wide limits but during the measurement it should be close to the constant value. For this reason we propose to remove from the table the maximum permitted steering time.

We also propose the change of the permitted value of the control effort on the steering wheel of the vehicles of categories M₁, N₁ and N₂ in the case of the intact of power assisted steering equipment.

This amendment we have already presented in our previous proposal in doc. TRANS/WP 29 /GRRF/1999/3 dated 19 November 1998.

In paragraph 6.2.2., after the table, we introduced the minimal control effort for all vehicles of these categories (we suggest that the minimal effort on the steering wheel should be not less than 2 daN).

This proposal should mainly apply to vehicles equipped with the power assisted steering systems (included EST) in which the control effort does not rise distinctly in relation to the intensity of the steering manoeuvre of the vehicle.

This feature is especially dangerous during the high speeds, particularly when the steering system has the small gear ratio that means the higher manoeuvrability at the small turn of the steering wheel.

The steering wheel serves also for the driver to maintain his proper position on the seat and with the small resistance on the steering wheel it is very probable for uncontrolled, accidental move to appear and in the effect very dangerous manoeuvre of vehicle.

In connection with above we propose to introduce into the electric controlled steering systems (EST) the progressive effort in relation to the turn of vehicle wheels.
