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**Economic Commission for Europe**

Inland Transport Committee

**World Forum for Harmonization of Vehicle Regulations****Working Party on Pollution and Energy****Sixtieth session**

Geneva, 8–11 June 2010

Item 6.3 of the provisional agenda

**Regulation No. 83****(Emissions of M<sub>1</sub> and N<sub>1</sub> categories of vehicles)****Proposal for draft amendments to Regulation No. 83****Submitted by the expert from the International Organization of Motor Vehicle Manufacturers \***

The text reproduced below was prepared by the expert from International Organization of Motor Vehicle Manufacturers (OICA) in order to amend the requirements of Regulation No. 83, to update the specifications for the proportional speed fan which can be used during testing of the vehicle on the chassis dynamometer. This document is based on informal document No. GRPE-59-06 distributed at the fifty-ninth session of the Working Party on Pollution and Energy (GRPE) (see report ECE/TRANS/WP.29/GRPE/59, para. 30). Modifications to the current provisions of the Regulation are marked in bold characters for new and as strikethrough for deleted text.

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\* In accordance with the programme of work of the Inland Transport Committee for 2006–2010 (ECE/TRANS/166/Add.1, 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.

## I. Proposal

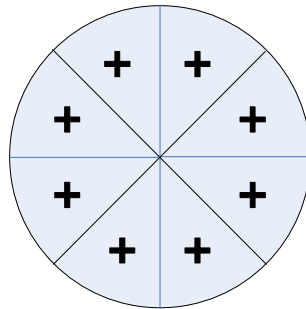
*Annex 4, paragraph 6.1.3., amend to read:*

“6.1.3. A current of air of variable speed shall be blown over the vehicle. The blower speed shall be within the operating range of 10 km/h to at least 50 km/h, or as an alternative, at the request of the manufacturer, within the operating range of 10 km/h to at least the maximum speed of the test cycle being used. The linear velocity of the air at the blower outlet shall be within  $\pm 5$  km/h of the corresponding roller speed within the range of 10 km/h to 50 km/h. At the range over 50 km/h, the linear velocity of the air shall be within  $\pm 10$  km/h of the corresponding roller speed. At roller speeds of less than 10 km/h, air velocity may be zero.

The above mentioned air velocity shall be determined as an averaged value of a number of measuring points which

(a) For blowers with rectangular outlets are located at the centre of each rectangle dividing the whole of the blower outlet into 9 areas (dividing both horizontal and vertical sides of the blower outlet into 3 equal parts).

(b) For circular blower outlets, the outlet shall be divided into 8 equal arcs by vertical, horizontal and  $45^\circ$  lines. The measurement points lie on the radial centre line of each arc ( $22.5^\circ$ ) at a radius of two thirds of the total (as shown in the diagram below).



**These measurements shall be made with no vehicle or other obstruction in front of the fan.** Each value at those points shall be within 10 per cent of the averaged value of themselves.

The device used to measure the linear velocity of the air shall be located at between 0 and 20 cm from the air outlet.

The final selection of the blower shall have the following characteristics:

- (i) Area: at least  $0.2 \text{ m}^2$ ;
- (ii) Height of the lower edge above ground: approximately 20 cm;
- (iii) Distance from the front of the vehicle: approximately 30 cm.

As an alternative, at the request of the manufacturer the blower speed shall be fixed at an air speed of at least 6 m/s (21.6 km/h).

The height and lateral position of the cooling fan can also be modified at the request of the manufacturer.”

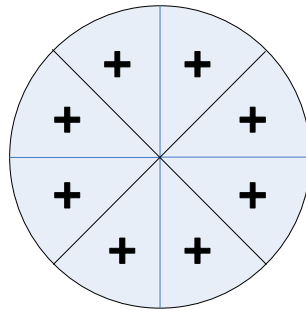
Annex 4a, paragraph 3.4.2., amend to read:

“3.4.2. A current of air of variable speed shall be blown over the vehicle. The blower speed shall be, within the operating range of 10 km/h to at least 50 km/h, or as an alternative, at the request of the manufacturer within the operating range of 10 km/h to at least the maximum speed of the test cycle being used. The linear velocity of the air at the blower outlet shall be within  $\pm 5$  km/h of the corresponding roller speed within the range of 10 km/h to 50 km/h. At the range over 50 km/h, the linear velocity of the air shall be within  $\pm 10$  km/h of the corresponding roller speed. At roller speeds of less than 10 km/h, air velocity may be zero.

The above mentioned air velocity shall be determined as an averaged value of a number of measuring points which:

(a) For blowers with rectangular outlets are located at the centre of each rectangle dividing the whole of the blower outlet into 9 areas (dividing both horizontal and vertical sides of the blower outlet into 3 equal parts).

(b) For circular blower outlets, the outlet shall be divided into 8 equal arcs by vertical, horizontal and  $45^\circ$  lines. The measurement points lie on the radial centre line of each arc ( $22.5^\circ$ ) at a radius of two thirds of the total (as shown in the diagram below).



**These measurements shall be made with no vehicle or other obstruction in front of the fan. Each value at those points shall be within 10 per cent of the averaged value of themselves.**

The device used to measure the linear velocity of the air shall be located at between 0 and 20 cm from the air outlet.

The final selection of the blower shall have the following characteristics:

- (i) Area: at least  $0.2 \text{ m}^2$ ;
- (ii) Height of the lower edge above ground: approximately 0.2 m;
- (iii) Distance from the front of the vehicle: approximately 0.3 m.

As an alternative, at the request of the manufacturer the blower speed shall be fixed at an air speed of at least 6 m/s (21.6 km/h).

The height and lateral position of the cooling fan can also be modified at the request of the manufacturer.”

## II. Justification

1. Amendments to the requirements in Annexes 4 and 4a regarding cooling fans were proposed to GRPE in informal document No. GRPE-55-10 in January 2008 in order to clarify the options between constant speed and speed proportional fans as these options had been prone to mis-interpretation. During discussion at GRPE, a request was made to adopt a “standard” measurement process for establishing the air speed of a fan that had been drafted for the project on Worldwide harmonized Motorcycle emission Test Cycle (WMTC). This procedure was then incorporated in ECE/TRANS/WP.29/GRPE/2008/6.
2. Due to the limited time available between GRPE and WP.29, no practical analysis of the requirements was made, rather an analysis of the text only which revealed that the text did not cover fans with a circular outlet.
3. OICA then proposed text for such fans in informal document No. GRPE-56-10 in June 2008 which was then incorporated into ECE/TRANS/WP.29/GRPE/2008/112 and duly adopted.
4. An investigation in the industry has since this amendment, however, revealed that many of the cooling fans currently in use (and presumably many fans in use with authorities, technical services and independent laboratories) do not meet the newly introduced conditions.
5. Another point that has however been revealed by this investigation, is that the adopted text does not state whether the airflow from the fan should be measured with the fan standing in free space (i.e. with no vehicle installed on the dynamometer), or in the state that the test is performed (i.e. with a vehicle installed on the dynamometer).
6. Should the measurements be made with or without a vehicle? The requirement is purely a specification of the fan suggesting that the “no car” measurements are correct, but the test is of course performed with a vehicle in place suggesting that the “car” measurements are correct. A comparison of “car” and “no car” measurements (see figure 1) reveals however that due to the flow restriction caused by the vehicle, no meaningful measurements can be made with a vehicle installed.
7. OICA therefore proposes to add the statement that air flow measurements must be made with no vehicle installed in front of the fan.
8. This still leaves the issue of the requirement for all measurement to be within  $\pm 10$  per cent of their average.
9. The data in figure 2 shows clearly that the central zone shows a greater deviation from the average than all of the outer zones. There is no requirement to make a central measurement for circular fans as this deviation would be expected along the axis of a propeller. However, many rectangular fans are merely rectangular outlets from a circular propeller and, therefore, requiring this central measurement from fans with rectangular outlets is also unreasonable.
10. The fact of the restriction presented by a vehicle during the test does, however, suggest that, providing all requirements regarding position, attitude and air flow rate of the fan are met, and considering that there is still the option to test with a constant speed fan, the requirements for consistency of speed measurement across the fan outlet are meaningless.
11. OICA therefore proposes to delete the  $\pm 10$  per cent requirement.

Figure 1

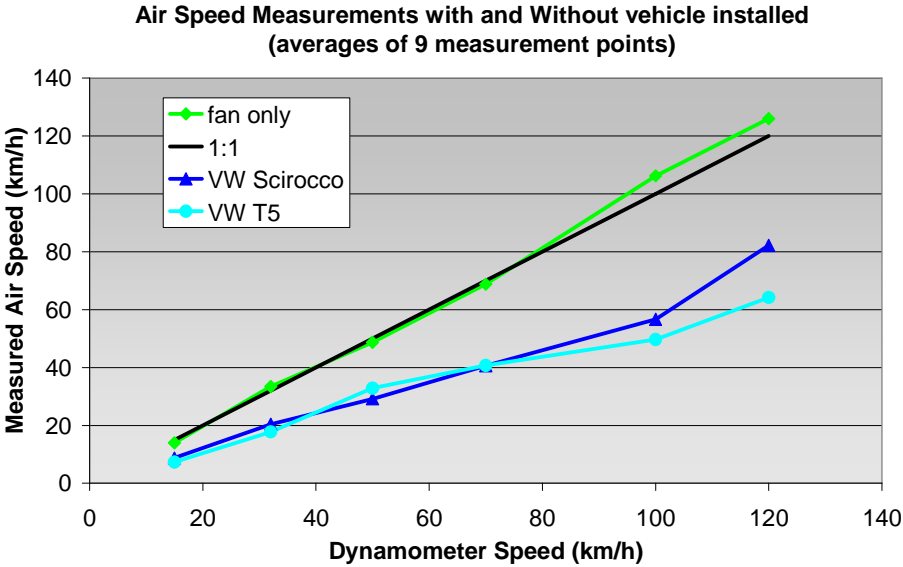


Figure 2

