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World Forum for Harmonization of Vehicle Regulations

Working Party on Noise

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Item 3(a) of the provisional agenda

REGULATION No. 51
(Noise of M and N categories of vehicles)

Proposal for amendments to Regulation No. 51

Submitted by the expert from the International Organization of Motor Vehicle Manufacturers ^{*/}

The proposal reproduced below was prepared by the expert from the International Organization of Motor Vehicle Manufacturers (OICA) in order to bring in line the requirements of Regulation No. 51 regarding the conditioning of mufflers containing absorbing fibrous materials with those of Regulation No. 59, which have recently been subject to modification. The modifications to the current text of the Regulation are marked in bold characters.

^{*/} 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 performance of vehicles. The present document is submitted in conformity with that mandate.

A. PROPOSAL

Insert a new paragraph 2.19., to read:

"2.19. "Design family"

For noise reduction systems or noise reduction system components, containing acoustically absorbing fibrous material, different design families may be considered. Noise reduction systems or noise reduction system components belong to the same design family when all the following characteristics are the same:

- (a) The exhaust gases in contact with the absorbing fibrous material have or have not a net gas flow through this material;**
- (b) The type of the fibres (e.g. basalt wool, biosil wool, glass wool, E-type wool, etc.);**
- (c) Binder material specifications (if applicable);**
- (d) Average fibre dimensions (thickness, length);**
- (e) Minimum bulk material packing density (kg/m³);**
- (f) Maximum contact surface between the gas flow and the absorbing material (e.g. perforation open area)."**

Annex 5, amend to read:

**"EXHAUST SYSTEMS CONTAINING ACOUSTICALLY ABSORBING
FIBROUS MATERIALS**

1. General

Absorbing fibrous materials may be used in silencing systems or components only when it is established by appropriate means of design and manufacturing, that the efficiency of the system in traffic conditions is sufficient to comply with the existing regulations. Such a silencing system is deemed to be effective in traffic conditions if the exhaust gas is not in contact with the absorbing fibrous materials or if the silencing system is of the same design family as a system to which type approval has already been granted. Unless one of these conditions is fulfilled, the complete silencing system or silencing system component shall be submitted to a conventional conditioning using one of three installations and procedures described below.

1.1. Continuous road operation for 10,000 km

1.1.1. About half this operation consists of town driving and the other half of long-distance runs at high speed; continuous road operation can be replaced by a corresponding test-track programme.

1.1.2. The two speed regimes **shall** be alternated on several occasions.

- 1.1.3. The complete test program **shall** include a minimum of 10 breaks of at least three hours duration in order to reproduce the effects of cooling and any condensation which may occur.
- 1.2. Conditioning on a test bench
- 1.2.1. Using standard parts and observing the vehicle manufacturer's instructions, the exhaust system or components thereof **shall** be fitted to the vehicle referred to in paragraph 3.3. of this Regulation or the engine referred to in paragraph 3.4. of this Regulation. In the former case the vehicle **shall** be mounted on a roller dynamometer. In the second case, the engine **shall** be coupled to a dynamometer.
- 1.2.2. The test **shall** be conducted in six six-hour periods with a break of at least 12 hours between each period in order to reproduce the effects of cooling any condensation which may occur.
- 1.2.3. During each six-hour period, the engine shall be run, under the following conditions in turn:
- (1) Five minutes at idling speed;
 - (2) One-hour sequence under 1/4 load at 3/4 of rated maximum speed (S);
 - (3) One-hour sequence under 1/2 load at 3/4 of rated maximum speed (S);
 - (4) 10-minute sequence under full load at 3/4 of rated maximum speed (S);
 - (5) 15-minute sequence under 1/2 load at rated maximum speed (S);
 - (6) 30-minute sequence under 1/4 load at rated maximum speed (S).

Total duration of the six sequences: three hours.

Each period **shall** comprise two sets of the six above-mentioned sequences.

- 1.2.4. During the test, the silencer **shall** not be cooled by a forced draught simulating normal airflow around the vehicle. Nevertheless, at the request of the manufacturer, the silencer may be cooled in order not to exceed the temperature recorded at its inlet when the vehicle is running at maximum speed.

1.3. Conditioning by pulsation

- 1.3.1. The exhaust system or components thereof **shall** be fitted to the vehicle referred to in paragraph 3.3. of this Regulation or the engine referred to in paragraph 3.4. of this Regulation. In the former case the vehicle **shall** be mounted on a roller dynamometer.

In the second case, the engine **shall** be mounted on a dynamometer. The test apparatus, a detailed diagram of which is shown in Figure 1 of the appendix to this annex **shall** be fitted at the outlet of the exhaust system. Any other apparatus providing equivalent results is acceptable.

- 1.3.2. The test apparatus **shall be adjusted in such** a way that the exhaust-gas flow is alternatively interrupted and re-established by the quick-action valve for 2,500 cycles.
- 1.3.3. The valve **shall** open when the exhaust-gas back pressure, measured at least 100 mm downstream of the intake flange, reaches a value of between **35 kPa and 40 kPa** (0.35 and 0.40 bar). It **shall** close when this pressure does not differ by more than 10 per cent from its stabilized value with the valve open.
- 1.3.4. The time-delay switch shall be set for the duration of gas exhaust resulting from the provisions laid down in paragraph 1.3.3. above.
- 1.3.5. Engine speed **shall** be 75 per cent of the speed (S) at which the engine develops maximum power.
- 1.3.6. The power indicated by the dynamometer **shall** be 50 per cent of the full-throttle power measured at 75 per cent of engine speed (S).
- 1.3.7. Any drain holes **shall** be closed off during the test.
- 1.3.8. The entire test **shall** be completed within 48 hours.

If necessary, one cooling period will be observed after each hour."

B. JUSTIFICATION

During its forty-ninth session, the Working Party on Noise (GRB) had reviewed and agreed to the proposed changes to UNECE Regulation No. 59 which are contained in working document ECE/TRANS/WP.29/GRB/2008/5/Rev.2, subject to a final review by GRB during its fiftieth session. In this respect, it is suggested to update Annex 5 of ECE Regulation No. 51 on the same subject to align the requirements with regard to the conditioning of mufflers.
