

PROPOSAL FOR AMENDMENTS TO REGULATION N° 51

(UNIFORM PROVISIONS CONCERNING THE APPROVAL OF MOTOR VEHICLES HAVING AT
LEAST FOUR WHEELS WITH REGARD TO THEIR SOUND EMISSIONS)

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 silencing systems or silencing system components containing absorbing fibrous materials with those of Regulation No. 59, which have recently been subject to modification.

During the first presentation of the proposal at GRB-50 (ECE/TRANS/WP.29/GRB/2009/6), some Contracting Parties requested further improvement. This new proposal takes into account those comments and remarks. For the sake of clarity, changes to the wording presented in ECE/TRANS/WP.29/GRB/2009/6 are marked up.

PROPOSAL

Amend the text of ECE R 51 to read:

2. DEFINITIONS

...

"2.19. Design family of silencing system or silencing system components"

Silencing systems or components thereof belong to the same design family if all of the following characteristics are the same:

- (a) **The exhaust gases in contact with the absorbing fibrous material have net gas flow through this material: (yes or no)**
- (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)."**

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Amend the text of Annex 5 to read:

ANNEX 5

~~EXHAUST~~ **SILENCING SYSTEMS CONTAINING ACCOUSTICALLY ABSORBING FIBROUS MATERIALS**

1. General

Sound absorbing fibrous materials may be used in silencing systems or components thereof only if

- a) the exhaust gas is not in contact with the fibrous materials or if**
- b) the silencing system or components thereof are of the same design family as systems or components for which it has been proven, in the course of type approval process in accordance with the requirements of this regulation for another vehicle-type, that they are not subject to deterioration.**

Unless one of these conditions is fulfilled, the complete silencing system or components thereof shall be submitted to a conventional conditioning using one of three installations and procedures described below.

~~Fibrous materials shall not be used in the construction of silencers unless suitable measures are undertaken at the design or production stages to ensure that the efficiency required to comply with the limits imposed in Paragraph 6.2.2 of this Regulation is achieved on the road. Such a silencer shall be considered to be efficient on the road if the exhaust gases are not in contact with the fibrous materials or if the silencer of the prototype vehicle tested in accordance with the requirements of Paragraphs 3.1 and 3.2 of this Regulation has been put into a normal state for road use before the sound level measurements are taken. This can be achieved by using one of the three tests described in~~

1.1. Continuous road operation for 10,000 km

- 1.1.1. 50±20 %** ~~About half of this operation shall consist~~ consists of **urban town** driving and **the remaining operation shall** be the other half of long-distance runs at high speed; continuous road operation may be replaced by a corresponding test-track programme.
- 1.1.2. The two speed regimes shall** ~~should~~ be alternated at **least twice** ~~several~~ occasions.

1.1.3. The complete test program **shall must** 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 **silencing exhaust** system or components thereof **shall must** 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 must** be mounted on a roller dynamometer. In the second case, the engine **shall must** be coupled to a dynamometer.

1.2.2. The test **shall must** 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 six sequences: three hours.~~

Each period **shall must** comprise two **sequenced** sets of the six above-mentioned **conditions sequences in consecutive order from (1) to (6)**.

1.2.4. During the test, the **silencing system or components thereof silencer shall must** not be cooled by a forced draught simulating normal airflow around the vehicle. Nevertheless, at the request of the manufacturer, the **silencing system or components thereof 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 **silencing exhaust** system or components thereof **shall must** 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 must** be mounted on a roller dynamometer.

In the second case, the engine **shall must** be mounted on a dynamometer. The test apparatus, a detailed diagram of which is shown in Figure 3 of the appendix to this annex **shall must** be fitted at the outlet of the **silencing exhaust** system. Any other apparatus providing equivalent results is acceptable.

- 1.3.2. The test apparatus **shall must** 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 must** open when the exhaust-gas back pressure, measured at least 100 mm downstream of the intake flange, reaches a value of between **35 and 40kPa** ~~0.35 and 0.40 bar~~. It **shall must** close when this pressure does not differ by more than 10 % 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 must** 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 must** 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 must** be closed off during the test.
- 1.3.8. The entire test **shall must** be completed within 48 hours.

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

JUSTIFICATION

The provisions for the conditioning of silencing systems containing fibrous material should be adapted to the technological progress. While at the time of the initial development of Annex 5 the employed fibrous materials were subject to deterioration during their lifetime, their improved quality today typically does not show this characteristic anymore. The proposed changes intend to enable the transposition of findings from one silencing system to another under clearly defined conditions. This disburdens the certification procedure and ensures at the same time, that the final test result has the same quality of significance as the actual procedure.

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