

**Economic and Social Council**Distr.: General
23 November 2015

Original: English

Economic Commission for Europe**Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****Working Party on Brakes and Running Gear****Eighty-first session**

Geneva, 1-5 February 2015

Item 6 of the provisional agenda

Regulation No. 90 (Replacement brake linings)**Proposal for a Supplement to the 02 series of amendments
to Regulation No. 90 (Replacement brake linings)****Submitted by the experts from Italy***

The text reproduced below was prepared by the experts from Italy to introduce, in the text of Regulation No. 90, requirements for the approval of replacement brake lining assemblies for L-category vehicles. The modifications to the existing text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2014–2018 (ECE/TRANS/240, para. 105 and ECE/TRANS/2014/26, 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

Add a new paragraph 3.3.1.3., to read:

- "3.3.1.3. **In the case of brake lining assemblies for vehicles of category L, the list of brake lining assemblies belonging to the same group defined according to Annex 7a. This list shall indicate for each brake lining assembly: name of brake lining assembly manufacturer, the brake lining assembly manufacturer's code, the friction material area (cm²).**

Add a new paragraph 4.2.4., to read:

- "4.2.4. **In the case of brake lining assemblies for vehicles of category L, brake lining assemblies belonging to the same group defined according to the criteria of Annex 7a, shall be assigned the same approval number of the one assigned to the representative brake lining assembly.**

Amend the paragraph 5.2.1.5., to read (footnote remain unchanged):

- "5.2.1.5. Replacement brake lining assemblies for vehicles of category L

It is allowed the verification of a brake lining assembly deemed to be representative of a group of brake lining assemblies, grouped according to the criteria defined in Annex 7a.

The representative brake lining assembly is deemed to identify the most severe application.

Results obtained with that representative brake lining assembly are considered valid for all the brake lining assemblies belonging to the same group defined according to the grouping criteria as from Annex 7a.

At least one set of the chosen replacement brake lining assemblies, representing the type of lining to be approved, shall be installed and tested in at least one vehicle which is representative of the vehicle type for which approval is sought, according to the prescriptions of Annex 7 and shall satisfy the requirements stated in this annex. The representative vehicle(s) shall be selected from among the application range using a worst case analysis⁴."

Add a new Annex 7a, as follows:

"Criteria to define groups of brake lining assembly for vehicles of category L

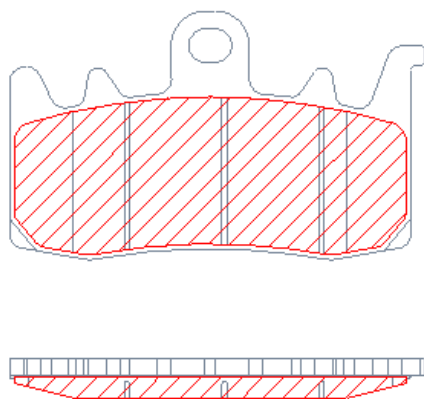
1. Grouping criteria

The grouping is made according to the following approach:

- (a) According to the individual friction material of the brake lining;**
- (b) Depending on the area of the friction material area of the brake lining assembly operated by the piston/pistons of only one side of the brake caliper;**

Friction material area means all the area enclosed within the perimeter of the brake lining (see the red cross-hatched area, Figure 1), thus excluding the presence of any grooves and/or chamfers:

Figure 1



3 area groups are foreseen, as in Table 1:

Table 1

Group	Brake lining area [cm ²]
A	≤15
B	> 15 ≤ 22
C	> 22

2. Procedure for selection of the brake lining assembly representative of the group to be approved

The brake lining assembly to be approved is defined, according to the following criteria:

- (a) Choice of friction material to be approved;
- (b) Verification of the applications where the chosen friction material is applied;
- (c) Definition of the area of the selected brake lining assemblies according to Table 1, and classification into groups A – B – C;
- (d) For each group, selection of the most severe application, according to the highest value of the index E_p (kinetic energy by brake lining area), as follows:

$$E_p = \frac{1}{2} * M * p * (V * c)^2 / (S * q_p)$$

where:

E_p = kinetic energy index [kJ/cm²]

M = gross vehicle weight of the vehicle [kg]

p = allocation percentage of the vehicle weight:

- for front braking system:
 - 75% in case of 1 brake disc
 - 37.5% in case of 2 brake discs
- for rear braking system:
 - 50%

V = vehicle maximum speed [m/s]

c = correction coefficient of speed:

- **for front braking system = 0.8**
- **for rear braking system: variable according to the brake disc diameter:**
 - **0.5 for $\varnothing \leq 245$ [mm]**
 - **0.6 per $\varnothing > 245 < 280$ [mm]**
 - **0.75 per $\varnothing \geq 280$ [mm]**

S = brake lining area as defined in Table 1 [cm²].

q_p = number of pads in 1 caliper

3. Extension of the homologation for new application

For new application that will be included into an existing group, an increase of 10% MAX

kinetic energy index (E_p = kinetic energy [kJ/cm²]) is allowed with reference to the value

used for the approval of the brake lining assembly of the reference group."

II. Justification

1. In the case of vehicle of category L, the types of different brake lining assemblies are very numerous, with a very low quantity of parts marketed belonging to same type. Just as an example, a medium size manufacturer producing around 600 types of brake lining assemblies referring to 12,000 different application with 4 different materials, proceed with 2,400 requests of type approval.

2. The grouping is therefore needed to steadily reduce the burden for approval sustained by the manufacturer. The medium size manufacturer referred in item 1, would carry out only 12 type approval tests, making the application of Regulation No. 90 really sustainable and feasible.

3. E_p (kinetic energy index) has been selected as criteria to select the most severe application, since it is the most relevant data as far as the stress applied to the brake lining assembly.