



**Economic and Social
Council**

Distr.
GENERAL

TRANS/WP.29/GRRF/2005/17
8 July 2005

Original: ENGLISH
ENGLISH AND FRENCH ONLY

ECONOMIC COMMISSION FOR EUROPE

INLAND TRANSPORT COMMITTEE

World Forum for Harmonization of Vehicle Regulations (WP.29)

Working Party on Brakes and Running Gear (GRRF)
(Fifty-eighth session, 20-23 September 2005,
agenda item 3.)

PROPOSAL FOR DRAFT AMENDMENTS TO REGULATION No. 90

(Replacement brake linings)

Transmitted by the expert from the Federation of European Manufacturers of
Friction Materials (FEMFM)

Note: The text reproduced below was prepared by the expert from FEMFM in order to insert into the Regulation new test provisions for bedding of brake linings. The modifications to the existing text of the Regulation are marked in **bold** characters.

A. PROPOSAL

Annex 3,

Paragraph 1.1, amend to read (inserting a new title and deleting the last sub-paragraph):

"1.1. **Test preparation**

1.1.1. Test vehicle

A vehicle which is
.... as required by Regulation No. 13."

Insert new paragraphs 1.1.2. to 1.1.2.3., to read:

"1.1.2. Bedding (burnishing) procedure

1.1.2.1. General conditions

Brake lining assemblies submitted for test shall be fitted to the relevant brakes. In the case of replacement brake lining assemblies, new brake linings must be used. Drum brake linings may be machined to achieve the best possible initial contact between the linings and drum(s). The test vehicle shall be fully laden.

Original brake lining assemblies used for comparison test and already fitted to the test vehicle may be used provided they are in a good condition and have not been worn out by more than 20 per cent of the initial thickness. They must not show damages, cracks, excessive corrosion or signs of overheating. They shall be bedded to the procedure described below."

1.1.2.2. Procedure

Perform a minimum 50 km driving distance and at least 100 brake applications at varying decelerations (at least between 1 m/s² and 5 m/s²) with initial speeds between 50 km/h and 120 km/h. A temperature range between 250 °C and 500 °C for pad assemblies or between 150 °C and 250 °C for drum brake lining assemblies (measured at the rubbing surface of the disc or drum) must be achieved at least 3 times during the bedding procedure. Temperatures must not exceed 500 °C for pad assemblies and 250 °C for drum brake lining assemblies."

1.1.2.3. Performance check

By braking only one axle at a time perform 5 brake applications from 70 km/h to 0 km/h (front axle) and 45 km/h to 0 km/h (rear axle) at a line pressure of 4 MPa and with an initial temperature of 100 °C for each stop. The 5

consecutive non monotonic results must remain within the tolerance of 0.6 m/s² (front axle) or 0.4 m/s² (rear axle) of their mean fully developed deceleration.

If this requirement is not fulfilled the bedding procedure according to paragraph 1.1.2.2. must be extended and the performance check according to paragraph 1.1.2.3. must be repeated."

Paragraph 2.2.2.3., amend to read:

"2.2.2.3. Brake linings submitted for test shall be fitted to the relevant brakes and **bedded (burnished) according to the following procedure:**

Burnishing Phase 1, 64 snubs from 80 km/h to 30 km/h at varying line pressures:

Parameter	Front axle	Rear axle	Rear axle
		Disc brake	Drum brake
Number of snubs per cycle	32	32	32
Brake speed (km/h)	80	80	80
Release speed (km/h)	30	30	30
Initial brake temperature (°C)	< 100	< 100	< 80
Final brake temperature (°C)	Open	Open	Open
Pressure snub 1 (kPa)	1 500	1 500	1 500
Pressure snub 2 (kPa)	3 000	3 000	3 000
Pressure snub 3 (kPa)	1 500	1 500	1 500
Pressure snub 4 (kPa)	1 800	1 800	1 800
Pressure snub 5 (kPa)	2 200	2 200	2 200
Pressure snub 6 (kPa)	3 800	3 800	3 800
Pressure snub 7 (kPa)	1 500	1 500	1 500
Pressure snub 8 (kPa)	2 600	2 600	2 600
Pressure snub 9 (kPa)	1 800	1 800	1 800
Pressure snub 10 (kPa)	3 400	3 400	3 400
Pressure snub 11 (kPa)	1 500	1 500	1 500
Pressure snub 12 (kPa)	2 600	2 600	2 600
Pressure snub 13 (kPa)	1 500	1 500	1 500
Pressure snub 14 (kPa)	2 200	2 200	2 200
Pressure snub 15 (kPa)	3 000	3 000	3 000
Pressure snub 16 (kPa)	4 600	4 600	4 600
Pressure snub 17 (kPa)	2 600	2 600	2 600
Pressure snub 18 (kPa)	5 100	5 100	5 100
Pressure snub 19 (kPa)	2 200	2 200	2 200
Pressure snub 20 (kPa)	1 800	1 800	1 800
Pressure snub 21 (kPa)	4 200	4 200	4 200
Pressure snub 22 (kPa)	1 500	1 500	1 500
Pressure snub 23 (kPa)	1 800	1 800	1 800
Pressure snub 24 (kPa)	4 600	4 600	4 600

Pressure snub 25 (kPa)	2 600	2 600	2 600
Pressure snub 26 (kPa)	1 500	1 500	1 500
Pressure snub 27 (kPa)	3 400	3 400	3 400
Pressure snub 28 (kPa)	2 200	2 200	2 200
Pressure snub 29 (kPa)	1 800	1 800	1 800
Pressure snub 30 (kPa)	3 000	3 000	3 000
Pressure snub 31 (kPa)	1 800	1 800	1 800
Pressure snub 32 (kPa)	3 800	3 800	3 800
Number of cycles	2	2	2

Burnishing Phase 2, 10 stops from 100 km/h to 5 km/h at 0.4 g deceleration and increasing initial temperatures:

Parameter	Front axle	Rear axle Disc brake	Rear axle Drum brake
Number of stops per cycle	10	10	10
Brake speed (km/h)	100	100	100
Release speed (km/h)	< 5	< 5	< 5
Deceleration level (g)	0.4	0.4	0.4
Maximum pressure (kPa)	16 000	16 000	10 000
Initial temperature 1 (°C)	< 100	< 100	< 100
Initial temperature 2 (°C)	< 215	< 215	< 151
Initial temperature 3 (°C)	< 283	< 283	< 181
Initial temperature 4 (°C)	< 330	< 330	< 202
Initial temperature 5 (°C)	< 367	< 367	< 219
Initial temperature 6 (°C)	< 398	< 398	< 232
Initial temperature 7 (°C)	< 423	< 423	< 244
Initial temperature 8 (°C)	< 446	< 446	< 254
Initial temperature 9 (°C)	< 465	< 465	< 262
Initial temperature 10 (°C)	< 483	< 483	< 270
Number of cycles	1	1	1

Recovery, 18 snubs from 80 km/h to 30 km/h at line pressure of 3 000 kPa:

Parameter	Front axle	Rear axle Disc brake	Rear axle Drum brake
Number of stops per cycle	18	18	18
Brake speed (km/h)	80	80	80
Release speed (km/h)	30	30	30
Pressure (kPa)	3 000	3 000	3 000
Initial brake temperature (°C)	< 100	< 100	< 80
Final brake temperature (°C)	Open	Open	Open
Number of cycles	1	1	1

Insert a new paragraph 2.2.2.4., to read:

"2.2.2.4. Perform 5 brake applications from 80 km/h to 0 km/h at a line pressure of 4 MPa and with an initial temperature of 100 °C for each stop. The 5 consecutive non-monotonic results must remain within the tolerance of 0.6 m/s² of their mean fully developed deceleration.

If this requirement is not fulfilled the first part of the bedding procedure "Burnishing Phase 1" must be repeated until the required performance stability is achieved."

Paragraph 2.2.2.4. (former), renumber as paragraph 2.2.2.5. and amend to read:

"2.2.2.5. The use of cooling air is permitted. The speed of the airflow during the brake application at the brake shall be:

$$v_{\text{air}} = 0.33 v$$

where:

v = vehicle test speed at initiation of braking."

B. JUSTIFICATION

Until now the bedding of brake linings for the purpose of Regulation No. 90 testing is done according to the manufacturer's instructions. Based on experience gathered during some years of practice with Regulation No. 90, some delegates of GRRF have opened the discussion whether the bedding (burnishing) should be somehow regulated. It had been found that sometimes manufacturers used "unrealistic" methods of brake lining treatment before test. Thus, FEMFM was asked to submit a proposal for a suitable method.

FEMFM had always stated that a fixed bedding procedure would cause problems because it is in the nature of friction materials to behave differently on the same kind of treatment. Furthermore, it must be taken into consideration that any method should provide an appropriate duration of the bedding in relation to the testing itself. Some thermal treatment during bedding is suitable to achieve this target.

With the proposal above FEMFM has tried to find a solution for the conflicting requirements by defining appropriate boundary conditions for the vehicle bedding. Regarding the dynamometer test, it was found suitable to propose the bedding procedure used in the SAE 2522 standard also known as "AK-Master" test. The latter is a widely accepted standard in the automotive industry and used by many friction material, brake and vehicle manufacturers.

This proposal refers to Annex 3 of Regulation No. 90, thus, dealing so far only with passenger cars and light commercial vehicles. However, they make more than 90 per cent of Regulation No. 90 approvals. After acceptance of GRRF, similar procedures may be found for the other categories of vehicles if GRRF requires so. The proposal has been widely discussed in the ad-hoc working group and is supported by this group.
