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**PROPOSAL FOR SUPPLEMENT 9 TO THE 01 SERIES OF AMENDMENTS TO
REGULATION No. 90**

(Replacement brake linings)

Submitted by Working Party on Brakes and Running Gear (GRRF)

Note: The text reproduced below was adopted by GRRF at its sixtieth session. It is based on ECE/TRANS/WP.29/GRRF/2005/17, as amended by ECE/TRANS/WP.29/GRRF/2006/24. It is transmitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee (AC.1) for consideration (ECE/TRANS/WP.29/GRRF/60, para. 23).

Paragraph 4.5.1., footnote 3/, amend to read:

"3/ 36 for Lithuania, 37 for Turkey, 38 (vacant), 39 for Azerbaijan, 40 for The former Yugoslav Republic of Macedonia, 41 (vacant), 42 for the European Community (Approvals are granted by its Member States using their respective ECE symbol), 43 for Japan, 44 (vacant), 45 for Australia, 46 for Ukraine, 47 for South Africa, 48 for New Zealand, 49 for Cyprus, 50 for Malta, 51 for the Republic of Korea, 52 for Malaysia and 53 for Thailand. Subsequent numbers shall be assigned to ..."

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 Regulations Nos. 13 and 13-H."

Insert new paragraphs 1.1.2. to 1.1.2.3., (including a reference to a new footnote 1/ and the corresponding footnote 1/) 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 1/ 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."

1/ For other than hydraulic braking systems an equivalent input value should be used."

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 Disc brake	Rear axle 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

Parameter	Front axle	Rear axle Disc brake	Rear axle Drum brake
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."
