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World Forum for Harmonization of Vehicle Regulations**Working Party on Brakes and Running Gear****Sixty-eighth session**

Geneva, 21–23 September 2010

Item 5 of the provisional agenda

Regulation No. 90 (Replacement brake linings)**Proposal for amendments to document
ECE/TRANS/WP.29/GRRF/2009/23/Rev.2****Submitted by the experts from the European Association of Automotive
Suppliers and the International Organization of Motor Vehicle
Manufacturers ***

The text reproduced below was prepared by the experts from the European Association of Automotive Suppliers (CLEPA) and the International Organization of Motor Vehicle Manufacturers (OICA) to clarify the provisions of ECE/TRANS/WP.29/GRRF/2009/23/Rev.2. This document is based on Informal document No. GRRF-67-24 distributed at the sixty-seventh session of the Working Party on Brakes and Running Gear (GRRF) (see report ECE/TRANS/WP.29/GRRF/67, para. 23). Modifications to ECE/TRANS/WP.29/2009/23/Rev.2 are marked in bold for new 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 the performance of vehicles. The present document is submitted in conformity with that mandate.

I. Proposal

Paragraph 5.3.6.2.2.1., amend to read:

“5.3.6.2.2.1. Test group relating to the tests stipulated in paragraphs 1 to 4 of Annex 11 or Annex 12.

Brake drums may be grouped together as test groups on the basis that each permitted test group range is from the smallest inside diameter to the smallest inside diameter +10 per cent and by no more than 40mm on the rubbed width of the drum.”

Paragraph 6.2.1., amend to read:

“6.2.1. Every unit sold shall **be provided in some form with** at least the following information:”

Paragraph 6.2.1.2., amend to read:

“6.2.1.2. in the case of motor vehicles:

the principal make, type and trade name of the vehicle, the axle intended to be fitted and period of manufacturing of the vehicle; should the period of manufacture not be readily available a reference to the original part number/identification code may be used;”

Annex 11

The heading of paragraph 4.1.1.1.1., amend to read:

“4.1.1.1.1. Test conditions (brake disc thermal fatigue **test**)”

Paragraph 4.1.1.1.2., amend to read:

“4.1.1.1.2. Test program (brake disc thermal fatigue **test**)”

Table A11/4.1.1.1.2.

Test provision	Thermal fatigue test
Vehicle categories	M_1 / N_1
Type of braking	Sequential brake applications
Braking interval (= t_{total})	70 s
Number of brake applications per cycle	2
Brake torque in accordance with a deceleration of	5.0 m/s ²
Total number of braking cycles	100 or 150 (see 4.1.1.1.3.)
Brake applications from to	v_{max} 20 km/h
Initial temperature of the 1st brake application in each cycle	≤ 100 °C

v_{max} the v_{max} to be used to test the replacement part is that corresponding to the vehicle which has the highest ratio of kinetic energy to disc mass
 t_{bra} actual braking period during the application
 t_{acc} minimum acceleration time in accordance with the accelerating power of the respective vehicle
 t_{rest} rest period
 t_{total} Braking interval ($t_{bra} + t_{acc} + t_{rest}$)”

The heading of paragraphs 4.1.1.2.1., 4.1.1.2.2. and 4.1.1.2.3., amend to read:

- “4.1.1.2.1. Test conditions (brake disc thermal fatigue **test**)
- 4.1.1.2.2. Test program (brake disc thermal fatigue **test**)
- 4.1.1.2.3. Test result (brake disc thermal fatigue **test**)”

Paragraph 4.1.2.1.2., amend to read:

- “4.1.2.1.2. Test program (brake disc high load test)

The test has to be carried out according to the following table:

Table A11/4.1.2.1.2.

Test provision	High load test
Vehicle categories	M_1 / N_1
Type of braking	Single brake applications
Number of brake applications	70
Initial temperature at the beginning of braking	$\leq 100 \text{ }^\circ\text{C}$
Brake torque in accordance with a deceleration of	10.0 m/s ² (however, brake pressure $p \leq 16000 \text{ kPa}$)
Brake applications from to	v_{\max} 10 km/h

v_{\max} the v_{\max} to be used to test the replacement part is that corresponding to the vehicle which has the highest ratio of kinetic energy to disc mass”

Paragraphs 4.1.2.2.2., amend to read:

- “4.1.2.2.2. Test program (brake disc high load test)

500 brake applications are carried out from a speed of 50 km/h to 10 km/h with a brake torque **corresponding to a deceleration of 6 m/s²**.

Initial temperature: $\leq 200 \text{ }^\circ\text{C}$ ”

The heading of paragraphs 4.2.1.1.1., 4.2.1.1.2., 4.2.1.1.3. and 4.2.1.2.1., amend to read:

- “4.2.1.1.1. Test conditions (brake drum thermal fatigue **test**)
- 4.2.1.1.2. Test program (brake drum thermal fatigue **test**)
- 4.2.1.1.3. Test result (brake drum thermal fatigue **test**)
- 4.2.1.2.1. Test conditions (brake drum thermal fatigue **test**)”

Paragraph 4.2.1.2.2., amend to read:

- “4.2.1.2.2. Test program (brake drum thermal fatigue **test**)

Table A11/4.2.1.2.2.

Test provision	Thermal fatigue test
Type of braking	Sequential brake applications
Number of brake applications	250 or 300 (whichever is applicable) - see paragraph 4.2.1.2.3. NB: The test is interrupted when a through crack appears.
Brake torque in accordance with a deceleration of	3.0 m/s ²
Brake applications from to	130 80 km/h
Initial temperature of each brake application	≤ 50 °C
Cooling pursuant to paragraph 3.2.3.	permitted

The heading of paragraph 4.2.1.2.3., amend to read:

“4.2.1.2.3. Test result (brake drum thermal fatigue **test**)”

Paragraph 4.2.2.1.2., amend to read:

“4.2.2.1.2. Test program (brake drum high load **and thermal fatigue** test)

The test has to be carried out according to the following table:

Table A11/4.2.2.1.2.

"Bedding in" procedure	Make 100 consecutive snub applications with $v_1 = 80$ km/h and $v_2 = 10$ km/h and an initial temperature of ≤ 100 °C. The deceleration of the first application shall be constant 1.5 m/s ² . From the second up to the last application the pressure shall be constant and equivalent to the average of the first application. The bedding should be continued until a minimum of 80 per cent lining to drum contact is achieved.
Test provision	Brake drum high load test
Type of braking	Single brake applications
Number of brake applications	100
Initial temperature at the beginning of braking	≤ 100 °C
Brake torque in accordance with a deceleration of	10.0 m/s ² (however, brake pressure $p \leq 16000$ kPa)
Brake applications from to	v_{max} 10 km/h

v_{max} the v_{max} to be used to test the replacement part is that corresponding to the vehicle which has the highest ratio of kinetic energy to disc mass”

Paragraph 4.2.2.2.2., amend to read:

“4.2.2.2.2. Test program (brake drum high load test)

Table A11/4.2.2.2.2.

Test provision	High load test
Type of braking	Braking to less than 5 km/h
Total number of brake applications	150
Initial brake drum temperature at each brake application	≤ 100 °C
Brake applications from to	60 km/h ≤ 5 km/h
Brake torque in accordance with a deceleration of	6 m/s ²
Cooling (also deviating from paragraph 3.2.3. of this annex)	Permitted

Annex 12

Paragraph 4.1.1.1.2., amend to read:

“4.1.1.1.2. Test program (brake disc thermal fatigue **test**)”

Table A12/4.1.1.1.2.

Test provision	Thermal fatigue test
Vehicle categories	O ₁ / O ₂
Type of braking	Sequential brake applications
Braking interval (= t _{total})	70 s
Number of brake applications per cycle	2
Brake torque in accordance with a deceleration of	5.0 m/s ²
Total number of braking cycles	100 or 150 (see paragraph 4.1.1.1.3.)
Brake applications from to	80 km/h 20 km/h
Initial temperature of the 1st brake application in each cycle	≤ 100 °C

v_{max} maximum design speed (as per its range of use)
t_{bra} actual braking period during the application
t_{acc} minimum acceleration time in accordance with the accelerating power of the respective vehicle
t_{rest} rest period
t_{total} Braking interval (t_{bra} + t_{acc} + t_{rest})”

The heading of paragraphs 4.1.1.1.3., 4.1.1.2.1, 4.1.1.2.2. and 4.1.1.2.3., amend to read:

“4.1.1.1.3. Test result (brake disc thermal fatigue **test**)
4.1.1.2.1. Test conditions (brake disc thermal fatigue **test**)
4.1.1.2.2. Test program (brake disc thermal fatigue **test**)
4.1.1.2.3. Test result (brake disc thermal fatigue **test**)”

Paragraph 4.1.2.1., amend to read:

“4.1.2.1. Vehicles of categories O₁ and O₂

This test is conducted using a new disc, an original brake caliper of the vehicle(s) concerned and new brake lining assemblies of the vehicle(s) concerned which have been type approved according to Regulations No. 13, 13-H or 90 (in the condition as mounted on the vehicle, e.g. protective grease removed).

Worn brake linings may be replaced during the test if necessary.”

Insert new paragraphs 4.1.2.1.1. to 4.1.2.1.3., to read:

“4.1.2.1.1. Test conditions (brake disc high load test)

See paragraph 4.1.1.1.1. above.

4.1.2.1.2. Test program (brake disc high load test)

The test has to be carried out according to the following table:

Table A12/4.1.2.1.2.

Test provision	High load test
Vehicle categories	O ₁ /O ₂
Type of braking	Single brake applications
Number of brake applications	70
Initial temperature at the beginning of braking	≤ 100 °C
Brake torque in accordance with a deceleration of	10.0 m/s ² (however, brake pressure p ≤ 16 000 kPa)
Brake applications from to	80 10 km/h

4.1.2.1.3. Test result (brake disc high load test)

The test is regarded as having been passed if 70 or more brake applications are completed without damage or failure.

If less than 70 brake applications are completed before damage or failure then a test should be conducted on the original part and the results compared. If the damage or failure point is no worse than the number of cycles of the original part -10 per cent then the test is regarded as having been passed.

Damage in this context means:

- (a) Radial cracks on the friction surfaces which are longer than two thirds of the radial height of the friction surface.
- (b) Cracks on the friction surface which reach the inner or outer diameter of the friction surface.
- (c) Through-cracking of any friction ring.
- (d) Any type of structural damage or cracks in any area outside the friction surface.”

Paragraph 4.1.2.2.2., amend to read:

“4.1.2.2.2. Test program (brake disc high load test)

500 brake applications are carried out from a speed of 50 km/h to 10 km/h with a brake torque **corresponding to a deceleration of 6 m/s²**.

Initial temperature: ≤ 200 °C”

Paragraph 4.2.1.1.1., amend to read:

“4.2.1.1.1. Test conditions (brake drum thermal fatigue **test**)”

Paragraph 4.2.1.1.2., amend to read:

“4.2.1.1.2. Test program (brake drum thermal fatigue **test**)

Table A12/4.2.1.1.2.

Test provision	Thermal fatigue test
Type of braking	Sequential brake applications
Number of brake applications	250 or 300 (whichever is applicable) - see 4.2.1.1.3. NB: The test is interrupted when a through crack appears.
Brake torque in accordance with a deceleration of	3.0 m/s ²
Brake applications from to	130 80 km/h
Initial temperature of each brake application	≤ 50 °C
Cooling pursuant to paragraph 3.2.3.	Permitted

Paragraph 4.2.1.1.3., amend to read:

“4.2.1.1.3. Test result (brake drum thermal fatigue **test**)

The test is regarded as having been passed if **300** or more brake applications are completed without damage or failure.

If less than **300** brake applications but more than **250** brake applications are completed without damage or failure then the Technical Service must repeat the test on a new replacement part. Under these circumstances both tests must complete more than **250** brake applications without damage or failure for the part to have passed the test.

If less than 300 brake applications are completed before damage or failure then a test should be conducted on the original part and the results compared. If the damage or failure point is no worse than the original part then the test is regarded as having been passed.

Damage in this context means:

- (a) Cracks on the friction surface which are longer than two-thirds of the axial width of the friction surface.
- (b) Cracks on the friction surface which reach the axial outer end of the drum.
- (c) Through-cracking of the drum.

- (d) Any type of structural damage or cracks in any area outside the friction surface.”

Paragraph 4.2.1.2.1., amend to read:

“4.2.1.2.1. Test conditions (brake drum thermal fatigue **test**)”

Paragraph 4.2.1.2.2., amend to read:

“4.2.1.2.2. Test program (brake drum thermal fatigue **test**)

Table A12/4.2.1.2.2.

Test provision	Thermal fatigue test
Type of braking	Sequential brake applications
Number of brake applications	250 or 300 (whichever is applicable) - see 4.2.1.2.3. NB: The test is interrupted when a through crack appears.
Brake torque in accordance with a deceleration of	3.0 m/s ²
Brake applications from to	130 80 km/h
Initial temperature of each brake application	≤ 50 °C
Cooling pursuant to paragraph 3.2.3.	Permitted

The heading of paragraph 4.2.1.2.3., amend to read:

“4.2.1.2.3. Test result (brake drum thermal fatigue **test**)”

Paragraph 4.2.2.1.1., amend to read:

“4.2.2.1.1. Test conditions (brake drum high load test)

The inertia mass of the inertia dynamometer shall be determined in accordance with the requirements laid down in paragraphs 3.2.1., 3.2.1.1. and 3.2.1.2. of Annex 12.

The rotational speed of the dynamometer shall correspond to the linear test speed of the vehicle based on the mean of the largest and smallest dynamic rolling radius of the tyres authorized for that vehicle.”

Paragraph 4.2.2.2.2., amend to read:

“4.2.2.2.2. Test program (brake drum high load test)

Table A12/4.2.2.2.2.

Test provision	High load test
Type of braking	Braking to less than 5 km/h
Total number of brake applications	150
Initial brake drum temperature at each brake application	≤ 100 °C
Brake applications from	60 km/h
to	0 km/h
Brake torque in accordance with a deceleration of	6 m/s ²
Cooling (also deviating from paragraph 3.2.3. of this annex	Permitted

Annex 13, add the items., to read */:

“**Approval number 2/:**

Approval number 2/:”

II. Justification

1. A number of changes in the document are editorial to improve the consistency of wording and to bring clarity throughout the document.
2. A change in wording has been made to paragraph 5.3.6.2.2.1 to clarify what is permitted as a brake drum test group.
3. In paragraph 6.2.1, the wording has been changed to allow some latitude in how the required information is provided at the point of sale as the current wording does not deliver a practical “real world” solution for brake discs and drums.
4. In Annex 12, paragraph 4.1.2, a test is added for the high load testing of brake discs for O₁ and O₂ vehicles; this was missing in the first draft as these applications are currently few in number.
5. In Annex 12, paragraph 4.2.1.1.3, changes are made to the brake drum thermal fatigue test to bring the test in line with the same type of testing on other categories of vehicles.

*/ Note by the secretariat: A number should be assigned to these items.