Transmitted by the experts from CLEPA and OICA

Informal Document No. **GRRF-67-24**
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agenda item 6)

Regulation No. 90
(Replacement brake linings)

Proposal for amendments to Regulation No. 90

The text reproduced below was prepared by the experts from CLEPA (European Association of Automotive Suppliers) and OICA (Organisation Internationale des Constructeurs Automobiles). It is based on ECE/TRANS/WP.29/GRRF/2009/23/Rev.1. It clarifies the meaning of: Test Groups; Thermal Fatigue test; Deceleration and High Load testing procedure; Categories O_1 and O_2 Testing Program; Test Results and Conditions. The modifications to the existing text of the Regulation are marked in bold characters.

A. PROPOSAL

Amend paragraph 5.3.6.2.2.1., 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% and by no more than 40mm on the rubbed width of the drum"

Amend paragraph 6.2.1, to read:

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

Amend paragraph, 6.2.1.2., 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;"

Amend Annex 11 paragraph 4.1.1.1.1. and 4.1.1.1.2., to read:

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

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

Brake linings submitted for test shall be fitted to the relevant brakes and bedded (burnished) according to the procedure of Annex 3, paragraph 1.1.2.:

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/s²
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})"

Amend paragraph 4.1.1.2.1., 4.1.1.2.2. and 4.1.1.2.3., 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**)"

Amend paragraph 4.1.2.1.2., 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	≤ 100 °C
Brake torque in accordance with **a deceleration of** :	10.0 m/s² (however, brake pressure p ≤ 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"

Amend paragraph 4.1.2.2.2., 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/s 2**
Initial temperature: ≤ 200 °C"

Amend paragraphs 4.2.1.1.1. to 4.2.1.1.3. and, 4.2.1.2.1., 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**)"

Amend paragraph 4.2.1.2.2., 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**: [m/s²]	3.0
Brake applications from to	 130 80 km/h
Initial temperature of each brake application	≤ 50 °C
Cooling pursuant to paragraph 3.2.3.	permitted

"

Amend paragraph 4.2.1.2.3., to read:

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

Amend paragraph 4.2.2.1.2., to read:

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

"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/s² (however, brake pressure p ≤ 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"

Amend paragraph 4.2.2.2.2., 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/s²
Cooling (also deviating from paragraph 3.2.3. of this annex)	Permitted

"

Amend paragraph 4.1.1.1.2., 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**: [m/s²]	5.0
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})"

Amend paragraph 4.1.1.1.3., to read:

4.1.1.1.3. Test result (brake disc thermal fatigue **test)**

Amend paragraphs 4.1.1.2.1. to 4.1.1.2.3., 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**)"

Amend paragraph 4.1.2.1., to read:

"4.1.2.1. Vehicles of categories O_1 and O_2

"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	**O1/O2**
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/s² (however, brake pressure p ≤ 16000 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 2/3 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."

Amend paragraph 4.1.2.2.2., 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/s^2** Initial temperature: ≤ 200 °C"

Amend paragraph 4.2.1.1.1. and 4.2.1.1.2., 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**)

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**: [m/s²]	3.0
Brake applications from to	 130 80 km/h
Initial temperature of each brake application	≤ 50 °C
Cooling pursuant to 3.2.3.	Permitted

"

Amend paragraph 4.2.1.1.3, 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 2/3 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."

Amend paragraph 4.2.1.2.1., to read:

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

Amend paragraph 4.2.1.2.2,, 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**: [m/s²]	3.0
Brake applications from to	 130 80 km/h
Initial temperature of each brake application	≤ 50 °C
Cooling pursuant to paragraph 3.2.3.	Permitted

"

Amend paragraph 4.2.1.2.3., to read:

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

Amend paragraph 4.2.2.1.1., 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."

Amend paragraph 4.2.2.2.2., 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 standstill
Total number of brake applications	150
Initial temperature of the brake drum every time the brake is operated	≤ 100 °C
Brake applications from to	 60 km/h ≤ 5 km/h
Brake torque in accordance with a deceleration of:	6 m/s²
Cooling (also deviating from paragraph 3.2.3.)	permitted

"

Add the items, to read:

"Approval number 2/: .....

Approval number 2/: ..... "

B. JUSTIFICATION

A number of changes in the document are editorial to improve the consistency of wording and aid clarity throughout the document.

Additionally a change in wording has been made to Para 5.3.6.2.2.1 to clarify what is permitted as a brake drum test group.

In the case of Para 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.

In Annex 12 Para 4.1.2 a test is added for the high load testing of brake discs for O1 & O2 vehicles; this was missed in the first draft as these applications are currently of low volume.

Also in Annex 12 Para 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 The performance of a brake depends on.

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