

TYRES

Regulation No. 117

**(UNIFORM PROVISIONS CONCERNING THE APPROVAL OF TYRES WITH REGARD TO
ROLLING SOUND EMISSIONS AND TO ADHESION ON WET SURFACES
AND TO ROLLING RESISTANCE)**

Proposal for draft amendments to Regulation No. 117- Rev. 1

Submitted by the expert from France + [Japan](#)

The text reproduced below was prepared by the expert from France in order to amend the annex 8 and 9 of the TRANS/WP.29/GRB/2010/63e. The modifications to the existing text of the Regulation are in **bold** characters.

A. PROPOSAL

Annex 8 (informative)

Procedure for Technical Services Inter-Laboratory Comparison

1. General

- 1.1. This clause describes the procedure to be followed to perform inter-laboratory comparison. **The collected data can be used to define a reference based upon multiple Technical Service laboratory machines for the purpose of Annex 9.** It can be used for determination of assigned values (see paragraph 1.3. below) for a set of **alignment selected** reference tyres. **The aim of Annex 8 [is for tyre grading / is not for type approval].**
- 1.2. **This procedure requires a set of at least five appropriately selected tyres for alignment.** The C_r results of each **alignment selected** reference tyre measured by each Technical Service participating to the inter-laboratory comparison ~~according to standard ISO 5725 can be used~~ for determining the C_r assigned value for each **alignment selected** reference tyre. **Different sets of the same batch of these tyres are used to compare the measured C_r results among each Technical Service. A Technical Services inter-laboratory alignment formula is then established and shall be used to translate the results obtained on the different Technical Service machines into aligned results of each Technical Service, in order to provide assigned values to candidate machines when aligning with one Technical Service.**~~The procedure requires at least five predetermined reference tyres to be used by the Technical Service laboratory operating the machine.~~ Every Technical Service machine participating to the inter-laboratory comparison shall be in accordance with this Regulation **annex 6.**
- 1.3. The assigned value for each reference tyre is the general average of the results obtained by all Technical Service for this reference tyre in this inter-laboratory comparison.

2. Alignment Tyre Requirements.

The alignment tyres used to conduct the alignment procedure shall be identified to cover the needed usage range in terms of load index, C_r and F_r as follows :

- (a) **Cr values shall have a gap between two selected tyres of :**
- ~~— [1,0 +/- 0,5] N/kN for Class C1 and C2 tyres, and~~
 - ~~— [1,0 +/- 0,5] N/kN for Class C3 tyres.~~
 - **Cr values shall have a minimum range, between max. C_r value and min. C_r value of the alignment tyres, of:**
 - **3 N/kN for Class C1 and C2 tyres, and**
 - **2 N/kN for Class C3 tyres.**
- (b) **The selected tyre section width should be :**
- **≤ 245 mm for machines for Class C1 and C2 tyres, and**
 - **≤ 345 mm for machines for Class C3 tyres.**
- (c) **The selected tyre outer diameter should be :**
- **between 510 to 800 mm for Class C1 and C2 machines, and**

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- between 771 to 1143 mm for Class C3 machines.

(d) load index values shall adequately cover the range for the tyres to be tested, ensuring that the Fr values also cover the range for the tyres to be tested.

The number of selected tyres shall be equal to at least five, i.e. there shall be :

- at least five selected tyres for Class C1 and C2 tyres, and
- at least five selected tyres for Class C3 tyres.

Each alignment tyre shall be checked prior to use and replaced when :

- (a) it shows a condition which makes it unusable for further tests,
- (b) there are deviations of Cr for alignment tyre measurement greater than 1.5 per cent relative to earlier measurements after correction for any machine drift.

3. Technical Services inter laboratory comparison frequency.
The inter laboratory comparison process must be repeated at least every two years by each Technical Service laboratory in the list. During each two years period, the set of **alignment selected** tyres and their assigned values will not be changed.

4. Evolution of the list of participating Technical Services.

Any Technical Service may participate to the inter-laboratory comparison or withdraw from the list. During each two years period, the set of alignment tyres and their assigned values will not be changed.

A Technical Service entitled and willing to participate will receive a **alignment selected** tyre set, measure it according to annex 6 and get aligned according to annex 9 using the existing assigned values for each tyre.

[5. Alignment Procedure for **technical services participating to the inter-laboratory comparison (annex 8)**

~~a5.1.~~ Each time an alignment tyre is measured, the tyre/wheel assembly shall be removed from the machine and the entire test procedure specified in **section 4 of Annex 6 shall be followed again.**

b. **A list of all Technical Service laboratories willing to be part of the inter-laboratory comparison for the definition of the assigned values is established. Each Technical Service laboratory, shall measure each alignment tyre three times in accordance with section 4 of Annex 6 and applying the conditions in section 3 of Annex 6, provide the mean value and standard deviation established from the 3 measurements for each tyre.**

c. **The measurement standard deviation σ_m calculated using alignment tyres shall be ensured :**

- **not greater than 0.05 N/kN for tyres with LI=121 and below**
- **not greater than 0.05 N/kN for tyres with LI=122 and above.**

d. **Each participating Technical Service measures 3 times the Cr of each alignment tyre and provides the corresponding results, corrected for a temperature of 25°C and a drum diameter of 2 m. The average of the values given by all the participating Technical Services for each tyre is taken as the assigned value for this tyre.**

Each Technical Service “i” then correlates its measurements with the assigned values.

The correlation shall be performed using a linear regression technique, $A1_i$ and $B1_i$, given in the equation :

$$Cr_{ass} = A1_i \times Cr_{TS_i} + B1_i$$

Where :

- **Cr_{ass} is the assigned value of the Rolling Resistance Coefficient**
- **Cr_{TS_i} is the measured value of the rolling resistance coefficient by Technical Service i, including temperature and drum diameter influences.**

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- **The aligned Cr value for the Technical Service must take into account coefficients $A1_i$ and $B1_i$**

Annex 9 (informative)

Procedure for measurement machines alignment and monitoring requirements

1. Definitions

1.1. Alignment tyres

A ~~set~~ set of at least ~~5~~ **five** tyres **which are the same tyres**, measured by both the candidate and Technical Service machines to perform machine alignment.

1.2. Deviation of alignment tyre

Difference in terms of time compared with the mean rolling resistance coefficient measurement results for a given alignment tyre with the appropriate number of repetitions.

2. General

2.1. This annex describes the procedure to be followed if needed to align measurement results on assigned values issued from inter-laboratory comparisons. **The aim of Annex 9 [is for tyre grading / is not for type approval].**

2.2. The machine alignment procedure requires at least five alignment tyres used by the candidate laboratory operating the machine. ~~The exact number of alignment tyres is defined by the Technical Services according to the preliminary step described in paragraph 1.2 of annex 8.~~ These tyres are used to align candidate machine(s) by comparing the measured Cr results to the ones obtained by a Technical Service eligible in the inter-laboratory comparison. An alignment formula is then established and shall be used to translate the results obtained on the candidate machine into aligned results.

2.3. The alignment tyre set will be provided by the candidate laboratory to the Technical Service it chose to perform the alignment.

3. Conditions for Candidate Machine

The candidate machine shall be in accordance with **the annex 6** of this Regulation.

4. Alignment Tyre Requirements

4.1. ~~The predetermined~~ alignment tyres used to conduct the alignment procedure shall be identified to cover the needed usage range in terms of load index, Cr and Fr as follows :

~~(a) Cr values shall have a gap between two alignment tyres of:~~

~~1.0-1,5 +/- 0.5 N/kN for Class C1 and C2 tyres, and
1.0 +/- 0.5 N/kN for Class C3 tyres.~~

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- (a) **Cr values shall have a minimum range, between max.Cr value and min. Cr value of the alignment tyres, of:**
- **3 N/kN for Class C1 and C2 tyres, and**
 - **2 N/kN for Class C3 tyres.**
- (b) The alignment tyre section width should be :
- ≤ 245 mm for machines for Class C1 and C2 tyres, and
 - ≤ 345 mm for machines for Class C3 tyres.
- (c) The alignment tyre outer diameter should be :
- between 510 to 800 mm for Class C1 and C2 machines, and
 - between 771 to 1143 mm for Class C3 machines.

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- (d) load index values shall adequately cover the range for the tyres to be tested, ensuring that the Fr values also cover the range for the tyres to be tested.

The number of alignment tyres shall be equal to at least five, i.e. there shall be :

- at least five alignment tyres for Class C1 and C2 tyres, and
- at least five alignment tyres for Class C3 tyres.

4.2. Each alignment tyre shall be checked prior to use and replaced when:

- (a) it shows a condition which makes it unusable for further tests,
- (b) there are deviations of Cr for alignment tyre measurement greater than 1.5 per cent relative to earlier measurements after correction for any machine drift.

5. Alignment Procedure for **technical services participating to the inter-laboratory comparison (annex 8)**

~~a5.1.~~ Each time an alignment tyre is measured, the tyre/wheel assembly shall be removed from the machine and the entire test procedure specified in **section 4 of Annex 6 shall be followed again.**

b. A list of all Technical Service laboratories willing to be part of the inter-laboratory comparison for the definition of the assigned values is established. Each Technical Service laboratory, shall measure each alignment tyre three times in accordance with section 4 of Annex 6 and applying the conditions in section 3 of Annex 6, provide the mean value and standard deviation established from the 3 measurements for each tyre.

c. The measurement standard deviation σ_m calculated using alignment tyres shall be ensured :

- not greater than 0.05 N/kN for tyres with LI=121 and below
- not greater than 0.05 N/kN for tyres with LI=122 and above.

d. Each participating Technical Service measures 3 times the Cr of each alignment tyre and provides the corresponding results, corrected for a temperature of 25°C and a drum diameter of 2 m. The average of the values given by all the participating Technical Services for each tyre is taken as the assigned value for this tyre.

Each Technical Service “i” then correlates its measurements with the assigned values.

The correlation shall be performed using a linear regression technique, $A1_i$ and $B1_i$, given in the equation :

$$Cr_{_ass} = A1_i \times Cr_{_TSi} + B1_i$$

Where :

- $Cr_{_ass}$ is the assigned value of the Rolling Resistance Coefficient
- $Cr_{_TSi}$ is the measured value of the rolling resistance coefficient by Technical Service i, including temperature and drum diameter influences.
- The aligned Cr value for the Technical Service must take into account coefficients $A1_i$ and $B1_i$.

5.2 Alignment of candidate machine:

a) **Each time an alignment tyre is measured, the tyre/wheel assembly shall be removed from the machine and the entire test procedure specified in** paragraph 4 of Annex 6 shall be followed again. This requirement applies to both the Technical Service laboratory and the candidate laboratory.

~~b)5.2.~~ The Technical Service shall measure each alignment tyre three times in accordance with paragraph 4 of Annex 6 and applying the conditions in paragraph 3 of Annex 6, and provide the mean value and standard deviation established from the 3 measurements for each tyre.

~~c)5.3.~~ The candidate machine shall measure each alignment tyre three times in accordance with paragraph 4 of Annex 6 and applying the conditions in paragraph 3 of Annex 6, with a measurement standard deviation for each tyre of :

- (a) not greater than 0.075 N/kN for Class C1 and C2 tyres, and
- (b) not greater than 0.06 N/kN for Class C3 tyres.

If this measurement standard deviation exceeds this criterion with 3 measurements, then the number of measurement repetitions shall be increased to meet the criterion:

$$n = (\sigma_m/\gamma)^2$$

where :

$\gamma = \{0.043-0.029\}$ N/kN for Class C1 and C2 tyres, and
 $\gamma = \{0.035-0.029\}$ N/kN for Class C3 tyres.

~~d)5.4.~~ The alignment shall be performed by the candidate laboratory and shall be a linear regression technique, A and B, given in the equation :

$$C_{r_ass_TS} = A1 \times C_{r_TS_i} + B1$$

$$C_{r_TS_i} = A2 \times C_{r_CM} + B2$$

$$C_{r_ass_TS} = A1 \times (A2 \times C_{r_CM} + B2) + B1$$

where :

$C_{r_ass_TS}$ is the assigned value of the rolling resistance coefficient.

$C_{r_TS_i}$ is the measured value of the rolling resistance coefficient by the Technical service including temperature and drum diameter influences.

C_{r_CM} is the measured value of the rolling resistance coefficient by the candidate laboratory including temperature and drum diameter influences.

The aligned C_r value for the Technical Service shall take into account coefficients A1 and B1.

The aligned C_r value for the candidate laboratory shall take into account coefficients A1 and A2 as well as B1 and B2.

The measurement standard deviation estimate σ_m will also be given.

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67. The alignment process shall be repeated at least every second year and always after any significant machine change or any drift in ~~candidate~~ machine control tyre monitoring data.
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B. JUSTIFICATIONS

This proposal amending annex 8 and 9 results from the discussions held during last GRB meeting in February in Geneva. These annexes give the procedures to establish the assigned values in order to permit to a candidate laboratory to correct their own measurements for the purpose of the labeling of tyres (regulation (EC) N°1222/2009).

It takes into account remarks from Japan (informal document TRANS/WP.29/GRB/51-23) to clarify the procedure in annex 8.