

REGULATION No. 117
(Tyres rolling noise and wet grip adhesion)

Proposal for amendment to the document ECE/TRANS/WP.29/2010/63

This document supersedes informal document No. GRB-51-23 transmitted by Japan and presented at GRB of February 2010.

The modifications to the existing text of the Regulation are given in **bold** characters.

A. PROPOSAL

Insert a new “ANNEX 8”, to read:

Annex 8

(informative)

PROCEDURE FOR TECHNICAL SERVICES INTER-LABORATORY COMPARISON

1. General

This clause describes the procedure to be followed to perform inter-laboratory comparison in order to define a reference lab composed by multiple Technical Service laboratory machines for the purpose of Annex 9. It can be used for determination of assigned values (see § 3) for a set of alignment tyres.

This machines alignment procedure requires **at least five predetermined alignment tyres of the same sizes, **which are set of the same batch of tyres**, used by the candidate laboratory (Annex 9) operating the machine. The same physical set of these tyres is used to align several Technical Service machines by comparing the measured Cr 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 different Technical Services machines into aligned results of each Technical Services, in order to provide assigned values to candidate machines when aligning with one Technical Service.**

2. Conditions for Technical Services machines.

Every Technical Service machine participating to the inter-laboratory comparison must also be in accordance with this Regulation Annex 6.

2.1 Monitoring of the reference machine laboratory control tyre shall be carried out at intervals no greater than one month. Monitoring shall include a minimum of three separate measurements taken during this one month period. The average of the three measurements taken during a given one-month period shall be evaluated for drift from one monthly evaluation to another.

2.2 The laboratory shall ensure that, based on a minimum of three measurements, the reference machine maintains a value of $\sigma_m \leq 0.05$ N/kN. This may be done using the laboratory control tyres (as specified in 2.1).

2.3 The assigned value for each alignment tyre is the general average of the results obtained by all Technical Service for this alignment tyre in this inter-laboratory comparison.

3. Alignment Tyre Requirements

a. 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:

- **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.**
- **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.**
- **The alignment tyre outer diameter should be**
 - **between 510 to 800 mm for Class C1 and C2 machines**
 - **between 771 to 1143 mm for Class C3 machines**
- **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 alignment tyres for Class C1 and C2 tyres, and**
 - **at least five alignment tyres for Class C3 tyres.**

b. Each alignment tyre must be checked prior to use and replaced when:

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

4. Alignment Procedure

- 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 section 4 of Annex 6 shall be followed again.
- b. A sequence of all Technical Service laboratories willing to be part of the inter-laboratory comparison for the definition of the reference laboratory 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, to the next Technical Service laboratory in the sequence.

- c. The measurement standard deviation σ_m calculated using two 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.

5. Comparison regression definition

N Technical Services measure **at least five** alignment tyres of the same sizes of those used in Annex 8. The average value of each tyre is taken as reference value. Then, calling the average value of the j-th tyre $RRCave_j$

$$RRCave_j = \frac{\sum_{i=1}^N RRC_{ij}}{N} \quad (1)$$

where RRC_{ij} is the RRC value of the j-th tire measured by the i-th laboratory. j is either 1 or 2, corresponding to each of the alignment tyres. Each Technical Service then correlates its measurements with the average values. The correlation shall be performed using a liner regression technique, A1 and B1, given in the equation:

$$Cr_{_ass_TS} = A1 \times Cr_{_TS_i} + B1 \quad (2)$$

Where:

- $Cr_{_ass_TS}$ is the assigned value of the Rolling Resistance Coefficient to the Technical service including temperature and drum diameter influences.
- $Cr_{_TS_i}$ is the measured value of the rolling resistance coefficient by the Technical service including temperature and drum diameter influences.
- The aligned Cr value for the Technical Service must take into account coefficients A1 and B1 : when a candidate lab is requesting to perform the alignment to a Technical Service laboratory within the inter-laboratory sequence list, the issued value by the contacted Technical Service laboratory shall be corrected as above to represent the reference laboratory being defined by all the Technical Service laboratories in the list

The measurement standard deviation estimate, σ_m , shall also be given.

6. The alignment process must be repeated at least every two years and after any significant machine change or any drift in candidate machine control tyre monitoring data, by each Technical Service laboratory in the list.

Annex 9
(informative)

PROCEDURE FOR MEASUREMENT MACHINES ALIGNMENT
AND MONITORING REQUIREMENTS

“ANNEX 9 Paragraph 1.1.”, amend to read:

1.1. Alignment tyres

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

“ANNEX 9 Paragraph 4.1. (a)”, amend to read:

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 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.
- (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.

“ANNEX 9 Paragraph 5.3.”, amend to read:

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:

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

B. JUSTIFICATION

The EC proposal contains the provisions as Annex 8 on technical services inter-laboratory comparison testing and machine alignment so as to minimize variances in the measurement results between technical services.

Basically Japan supports this idea, but the alignment procedures in the EC proposal is vague, and current test procedures in ISO28580 does not specify how to maintain the accuracy among each technical service test site.

When selecting alignment tyres for the Annex 8 test, choosing same tyres is desirable in the point of ensuring the accuracy of the test. However, we think it is reasonable choosing same batch tyres for the Annex 8 test, because the test duration using same tyres takes many more days than using same batch tyres.

To ensure the accuracy of the alignment test, the difference between max. Cr value and min. Cr values of alignment tyres should be as follows:

For Class C1 and C2 tyres: not less than 3N/kN

For Class C3 tyres: not less than 2N/kN
