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## Economic Commission for Europe

Inland Transport Committee

**World Forum for Harmonization of Vehicle Regulations**

**Working Party on Noise**

**Fifty-second session**
Geneva, 6-8 September 2010

# Report of the Working Party on Noise on its fifty-second session (6-8 September 2010)

Contents

# I. Attendance

1. The Working Party on Noise (GRB) held its fifty-second session from 6 (afternoon) to 8 September 2010 in Geneva, under the chairmanship of Mr. Ch. Theis (Germany). Experts from the following countries participated in the work following Rule 1(a) of the Rules of Procedure of the World Forum for Harmonization of Vehicle Regulations (WP.29) (TRANS/WP.29/690 and Amend.1): Belgium; Canada; China; France; Germany; Hungary; India; Italy; Japan; Republic of Korea; Lituania; Netherlands; Norway; Poland; Russian Federation; South Africa; Spain; Sweden; Switzerland; United Kingdom of Great Britain and Northern Ireland and United States of America. Experts from the European Commission (EC) participated. Experts from the following non-governmental organizations also participated: European Association of Automobile Suppliers (CLEPA); International Motorcycle Manufacturers Association (IMMA); International Organization for Standardization (ISO); International Organization of Motor Vehicle Manufacturers (OICA). Upon the special invitation of the Chair, experts from the following non-governmental organizations participated: European Tyre and Rim Technical Organization (ETRTO); National Federation of the Blind (NFB); European Federation for Transport and Environment (T&E).

# II. Adoption of the agenda (agenda item 1)

*Documentation*: ECE/TRANS/WP.29/GRB/2010/4 and Corr.1

2. GRB considered and adopted the agenda proposed for the fifty-second session (ECE/TRANS/WP.29/GRB/2010/4 and Corr.1). The informal documents distributed during the session are listed in Annex I to this report.

# III. Regulation No. 41 (Noise of motorcycles) (agenda item 2)

*Documentation*: ECE/TRANS/WP.29/GRB/2009/3, ECE/TRANS/WP.29/GRB/2010/7, Informal document No. GRB-51-16

3. The expert from Italy, chairing the informal group on Regulation No. 41, recalled the discussion of GRB at its previous session (ECE/TRANS/WP.29/GRB/2009/3 and GRB-51-16) and reported on the progress of work made by the informal group during its meeting on 1 June 2010. Referring to the working papers available on the website http://www.unece.org/trans/main/wp29/wp29wgs/wp29grb/R41-14th.html, he informed GRB that the informal group could find an agreement on:

(a) an additional or enlarged plate;

(b) the new type approval test method for measuring the noise levels including provisions for anti-tampering; and

(c) the Additional Sound Emission Provisions (ASEP) including the so called mystery points.

4. He announced the informal group's intention to finalize the draft 04 series of amendments to Regulation No. 41 and to submit the proposal, as an official document, to GRB for a detailed consideration at its next session in February 2011. For this purpose, all GRB experts were invited to send their comments at latest by the end of September 2010 to the Secretary of the informal group (erwin.segers@honda-eu.com).

5. On the new limit values for the noise emissions of motorcycles, GRB welcomed the initiative of the informal group to set up a data base to collect type approval data on current noise levels.

6. The expert from ISO introduced ECE/TRANS/WP.29/GRB/2010/7 proposing a clarification to the stationary noise testing provisions with regard to vehicles in which the internal combustion engine does not operate during the stationary conditions. GRB adopted the proposal and agreed to submit it to WP.29 and AC.1 for consideration at their June 2011 sessions, together with the draft 04 series of amendments to Regulation No. 41 (see para. 4 above).

# IV. Regulation No. 51 (Noise of M and N categories of vehicles) (agenda item 3)

## A. Development (agenda item 3(a))

*Documentation*: ECE/TRANS/WP.29/GRB/2010/6, Informal documents Nos. GRB-51-13, GRB-51-20, GRB-52-02, GRB-52-04 and GRB-52-20

7. The expert from ISO introduced ECE/TRANS/WP.29/GRB/2010/6 proposing the same clarification to the provisions of Regulation No. 51 as mentioned under paragraph 6 above. GRB adopted the proposal and agreed to submit it to the World Forum for Harmonization of Vehicle Regulations (WP.29) and its Administrative Committee (AC.1) for consideration at their March 2011 sessions, as Corrigendum 3 to the 02 series of amendments to Regulation No. 51.

8. The expert from ISO informed GRB on the current status of the revision of standard ISO 10844 regarding the technical changes to the specifications of test tracks for vehicle noise measurements (GRB-52-02). He volunteered to present the final text of the updated ISO standard at the next session of GRB and expected that the document would then be published in 2012. GRB agreed to consider, at its next sessions, the necessary amendments to Regulations Nos. 41 and 51 with regard to the optional and mandatory application of these updated specifications of ISO 10844. GRB noted the position of the expert from the Netherlands (GRB-52-20) on the proposed range of values for the allowable texture. The expert from ISO stated that this issue had been discussed extensively within the ISO working group. He volunteered to take care of this issue and to come back to GRB at its next session in February 2011 with a possible solution.

9. Referring to GRB-51-20 and the discussion of GRB at its previous session, the expert from OICA presented GRB-52-04 showing the considerable contribution of the propulsion system, including the traction tyres, to the vehicle noise emissions in real urban traffic, especially for commercial vehicles equipped with a high powered engine, due to the high influence of the engine torque on traction tyre noise. GRB welcomed this information and agreed on the need to amend, in this respect, Regulation No. 51. The expert from OICA was invited to prepare a concrete proposal for consideration at the next GRB session.

## B. New sound limit values (agenda item 3(b))

*Documentation*: Informal documents Nos. GRB-52-07, GRB-52-11, GRB-52-13 and GRB-52-14

10. The expert from EC informed GRB of the ongoing procedure to set up a proposal for new sound limit values and presented the draft final report (GRB-52-07) on the comparison

of two noise measurement methods, based on type approval data received during the 2-year monitoring process. GRB followed with interest a presentation on the final results of a study (GRB-52-13) on the vehicle noise limit values (VENOLIVA), including possible policy options for the reduction of noise limit values. GRB noted also a presentation on the impact assessment of the policy options (GRB-52-14) of that study.

11. Referring to GRB-52-11, the expert from OICA raised concerns about the huge gap between the outcome of the VENOLIVA study and the results of the first test measurement programme, which had initially been performed already in 2004—2005 with huge financial efforts, by the automotive industry jointly with Japan and the United States of America (TRANS/WP.29/GRB/39, para. 8). He questioned the methodology applied for the evaluation of the noise measurement data. He also wondered why the data of a number of vehicles types have been removed from the database. He stated that the European Automobile Manufacturers Association (ACEA) had launched parallel evaluations, by two independent consultants, of the noise measurement data collected during the monitoring phase. He stated that the final report on these evaluations would be published in the near future and announced his intention to make the report available to all GRB experts. The expert from ETRTO expressed his doubts on the exaggerated amounts of costs mentioned in the VENOLIVA study as well as the statement on the low influence of tyres and the torque effect on noise levels. He suggested having a detailed consideration on these issues together with the experts from EC and OICA.

12. Concluding the discussion, the Chair invited all GRB experts to send their comments on the VENOLIVA study, not later than by the end of September 2010, to the expert from EC (Wolfgang.Schneider@ec.europa.eu). GRB agreed to resume consideration of this subject at its next session in February 2011.

## C. Additional sound emission provisions (agenda item 3(c))

*Documentation*: ECE/TRANS/WP.29/GRB/2009/4, ECE/TRANS/WP.29/GRB/2009/5, ECE/TRANS/WP.29/GRB/2010/5, ECE/TRANS/WP.29/GRB/2010/9, Informal documents Nos. GRB-52-09, GRB-52-12 and GRB-52-15

13. The expert from the United Kingdom withdrew ECE/TRANS/WP.29/GRB/2010/5. Following the agreement of GRB at its previous session on the need to conclude the work on the test method for additional sound emission provisions (ASEP), the Chair introduced ECE/TRANS/WP.29/GRB/2010/9 proposing a possible approach for the incorporation of ASEP provisions into Regulation No. 51. He added that this proposal should be considered as a package only. Referring to GRB-52-15, the expert from the Netherlands presented an updated stringency analysis of the proposed solutions and questioned the term “vehicle of concern”. The Chair presented GRB-52-09 providing a clarification of the understanding of “vehicle of concern” and possible consequences of the proposed approach.

14. The expert from EC welcomed the compromise solution and suggested moving forward with the proposed approach. The expert from Norway preferred to still include a “Not To Exceed (NTE)” value into the new provisions for ASEP. The expert from the United States of America renewed his concerns expressed during the previous session of GRB (ECE/TRANS/WP.29/GRB/49, para. 11). The expert from OICA presented a number of comments (GRB-52-12) on the Chair’s proposal for ASEP. He stated that this compromise solution could be acceptable for the automotive industry with the condition of a certain lead time necessary to develop the new cars according to these new specifications.

15. Following the discussion, a large majority of GRB experts agreed on the compromise solution proposed by the Chair. The GRB Chair volunteered to prepare a

concrete proposal for amendments to Regulation No. 51, for consideration by GRB at its next session on the basis of an official document.

## V. Regulation No. 59 (Replacement silencing systems) (agenda item 4)

*Documentation*: ECE/TRANS/WP.29/GRB/2008/5/Rev.2

16. Recalling the purpose of ECE/TRANS/WP.29/GRB/2008/5/Rev.2, the expert from CLEPA volunteered to prepare an updated proposal for amendments to Regulation No. 51. GRB agreed to have, at its next session in February 2011, a final review of the proposal on the basis of a new official document to be submitted by CLEPA.

## VI. Regulation No. 92 (Replacement exhaust silencing systems for motorcycles) (agenda item 5)

17. Referring to the ongoing work on Regulations Nos. 41 and 51 (see paras. 4 and 15 above), the expert from IMMA recommended adapting the provisions of Regulation No. 92 accordingly. GRB agreed to resume consideration of this subject at its next session on the basis of an official document to be submitted by the experts from IMMA.

## VII. Regulation No. 117 (Tyre rolling noise and wet grip adhesion) (agenda item 6)

*Documentation*: ECE/TRANS/WP.29/2010/63, ECE/TRANS/WP.29/GRB/2010/8, Informal documents Nos. GRB-52-05, GRB-52-06 and GRB-52-10

18. The expert from the Russian Federation presented GRB-52-10 proposing a clarification to the test procedure for measuring the tyre rolling resistance. The expert from ISO informed GRB that this issue was still under discussion within a working group of his organization. GRB agreed to resume consideration of this subject at its next session, if necessary.

19. The expert from ETRTO proposed a correction to the formula for the measurement reproducibility of rolling resistance GRB-52-05. GRB noted a number of comments and agreed to review the proposal at its next session in February 2011, on the basis of an updated official document to be submitted by the expert from ETRTO.

20. GRB noted that Revision 2 of Regulation No. 117 (including the 02 series of amendments) had been adopted by WP.29 at its June 2010 session, on the basis of document ECE/TRANS/WP.29/2010/63. The expert from EC introduced ECE/TRANS/WP.29/GRB/2010/8 proposing a number of corrections to Revision 2.

21. Following the discussion, GRB adopted the amendments proposed on pages 2 and 3 of ECE/TRANS/WP.29/GRB/2010/8, as amended below, and requested the secretariat to submit them to WP.29 and AC.1, as Corrigendum 1 to 02 series of amendments to Regulation No. 117, for consideration at their November 2010 sessions (see ECE/TRANS/WP.29/2010/146).

*Annex 7, footnote 1/ of paragraphs 2. and 3.1.1.*, amend "Refer to the appendix …" to read "See appendix …".

22. Upon the recommendation of WP.29 (ECE/TRANS/WP.29/1085, para. 50) at its June 2010 session, GRB considered an updated version of Annexes 8 and 9

(ECE/TRANS/WP.29/GRB/2010/8) for labelling purposes of tyres regarding rolling resistance as an outcome of the informal group on Special Tyre Definitions (STD). GRB noted GRB-52-06 and a number of comments, but could not find an agreement on both annexes. Following the discussion, it was agreed to reproduce the additional provisions on rolling resistance complementing the 02 series of amendments to Regulation No. 117 as Annex III to this report.

## VIII. Collective amendments to Regulations Nos. 41 (Noise of motorcycles), 51 (Noise of M and N categories of vehicles) and 59 (Replacement silencing systems) (agenda item 7)

23. The expert from the Netherlands announced his intention to prepare a concrete proposal in parallel with the new revision of the Regulations concerned. GRB agreed to resume consideration of this subject at its next session.

## IX. Exchange of information on national and international requirements on noise levels (agenda item 8)

24. GRB noted that no new information had been given under this agenda item.

## X. Influence of road surface on tyre rolling sound emissions (agenda item 9)

25. GRB noted that no new information had been given under this agenda item.

## XI. Quiet road transport vehicles (agenda item 10)

*Documentation*: Informal documents Nos. GRB-52-03, GRB-52-08, GRB-52-16, GRB-52-17, GRB-52-18 and GRB-52-19

26. The expert from the United States of America, chairing the informal group on Quiet Road Transport Vehicles (QRTV), reported on the good progress (GRB-52-16) made by the group at its second and third meetings held in Washington D.C. on 3 and 4 May 2010 and in Tokyo from 13 to 15 July 2010. He recalled the objectives of the informal group on QRTV and added that the future recommendations for acoustic warning devices for electric and hybrid vehicles could be used as a candidate for a global technical regulation (gtr), subject to the decision of GRB and WP.29. He announced the intention of the informal group on QRTV to meet again in Berlin, from 27 to 29 September 2010.

27. The Director of the UNECE Transport Division welcomed the activities of GRB and its efforts to set up such recommendations for QRTV. She underlined the need to take a holistic view which includes also other measures, such as new ways of thinking in road safety and particularly in road safety education, the out-of-the-box approach to future transport infrastructure (even with the possibility of geographically separated for different users). In this respect, she invited GRB experts to cooperate with other UNECE Working Parties, first of all with the UNECE Road Safety Forum (WP.1), the Working Party on Road Transport (SC.1) and the Working Party on Transport Trends and Economics (WP.5).

28. The expert from Poland stated that the increasing number of hybrid electric vehicles (HEV) resulted in higher risk for pedestrians and other vulnerable road users. The expert from the NFB referred to the technical report prepared by the US-National Highway Traffic

Safety Administration (NHTSA) on the incidence of pedestrian and bicyclist crashes by hybrid electric passenger vehicles (GRB-52-17). This study showed that HEV were two times more likely to be involved in a pedestrian crash than vehicles with an internal combustion engine.

29. The expert from Japan presented GRB-52-18 listing the factors for an "ideal warning sound" and possible concepts of approaching vehicles audible systems (AVAS). The expert from CLEPA stressed the need that a safe sound should be detectable, environmentally acceptable and recognizable (GRB-52-19). He suggested using, in this respect, a broadband sound.

30. The expert from CLEPA stressed the need to raise public awareness on the risk of QRTV (GRB-52-08). He invited all GRB experts to witness, in an outdoor demonstration with a number of HEV, the effectiveness of acoustic warning devices for such vehicles and to participate in an experimental test demonstration on audibility of broadband sounds. GRB followed with great interest that demonstration, organized jointly by the experts from CLEPA and Japan.

31. Following the outdoor demonstration, the expert from Japan introduced GRB-52-03 regarding a guideline on measures ensuring the audibility of hybrid and electric vehicles. He added that this guideline entered already into force in Japan. The expert from France underlined the urgency of establishing new provisions for quiet vehicles and, in this respect, welcomed the Japanese guideline as a first set of requirements. The expert from Sweden suggested adding the guidelines listed in GRB-52-03 as an annex to the Consolidated Resolution on the Construction of Vehicles (R.E.3), currently under revision (see para. 36 below). The expert from the United States of America preferred to append the guideline to the Special Resolution No. 1 (S.R.1), linked to the 1998 Agreement.

32. GRB referred GRB-52-03 to the informal group on QRTV to discuss the best possible follow-up to the document and agreed to resume consideration of this subject at its next session in February 2011.

## XII. Environmentally friendly vehicles (agenda item 11)

*Documentation*: Informal documents Nos. GRPE-60-21 and EFV-07-05

33. The Secretary informed GRB of the progress made during the sixth and seventh meetings of the informal group on environmentally friendly vehicles (EFV) which was held in Geneva on 11 June 2010 (GRPE-60-21 and EFV-07-05). GRB noted that the eighth informal meeting on EFV would be held in conjunction with the forthcoming session of the Working Party on Pollution and Energy (GRPE) in January 2011. GRB also noted the approach proposed by the EFV Chair to consider, as a first step, a single score evaluation of environmentally friendly vehicles such as parameters on $CO_2$ emissions, noise level, gaseous pollutants, the recyclability and type of fuels. Detailed information is available at: http://www.unece.org/trans/main/wp29/wp29wgs/wp29grpe/efv07.html.

34. GRB welcomed the proposed structure (ECE/TRANS/WP.29/GRPE/60, para. 44) of the future EFV concept document in a more general part with provisions for the well-to-tank approach and a more detailed part with technical specifications or recommendations for the tank-to-wheel approach, focusing on the construction of EFV and their environmental performance.

35. With regard to the parameters on noise (EFV-07-05), GRB would like to have a detailed discussion on this issue and suggested holding the ninth informal group on EFV prior to the next session of GRB in the morning of 15 February 2011.

## XIII. Consolidated Resolution on the Construction of Vehicles (agenda item 12)

*Documentation*: ECE/TRANS/WP.29/2009/123, ECE/TRANS/WP.29/2009/123/Corr.1, ECE/TRANS/WP.29/2009/123/Corr.2, ECE/TRANS/WP.29/2009/123/Corr.3, ECE/TRANS/WP.29/2009/123/Corr.4

36. GRB welcomed the revised proposal of the Consolidated Resolution on the Construction of Vehicles (R.E.3) and noted that a revised document would be published as ECE/TRANS/WP.29/2010/145. GRB experts were in principle in favour of the revised proposal, but agreed to have a detailed review, at its next session in February 2011, of the provision on noise emissions (chapter H) and on the methods and instruments for measuring noise inside motor vehicles (chapter AL). WP.29 might consider adding the guidelines on measures increasing the audibility of hybrid and electric vehicles (see para. 31 above) as an annex to the R.E.3, if appropriate.

## XIV. Election of officers (agenda item 13)

37. In compliance with Rule 37 of the Rules of Procedure (TRANS/WP.29/690 and Amend.1), GRB elected its officers on Wednesday afternoon. Mr. C. Theis (Germany) was unanimously re-elected Chair of GRB for the sessions scheduled in 2011.

## XV. Other business (agenda item 14)

*Documentation*: Informal document No. GRB-52-01

38. Upon the request of WP.29 at its March 2010 session (ECE/TRANS/WP.29/1083, para. 27), GRB noted the guidelines on establishing requirements for high-priority signals (GRB-52-01). As no Regulation currently under the responsibility of GRB was referring to warning signals or control systems, it was a general opinion that GRB was not concerned by the guidelines. Nevertheless, GRB agreed to review, at its next session in February 2011, the proposed text on auditory warnings (GRB-52-01, page 10).

## XVI. Provisional agenda for the fifty-third session

39. The following provisional agenda was adopted for the fifty-third session of GRB, scheduled to be held in Geneva from 15 (starting at 2.30 p.m.) to 17 (concluding at 5.30 p.m.) February 2011:

1. Adoption of the agenda.
2. Regulation No. 41 (Noise of motorcycles): Development.
3. Regulation No. 51 (Noise of M and N categories of vehicles):
   (a) Development;
   (b) New limit values;
   (c) Additional sound emission provisions.
4. Regulation No. 59 (Replacement silencing systems).
5. Regulation No. 92 (Replacement exhaust silencing systems for motorcycles).
6. Regulation No. 117 (Tyre rolling noise and wet grip adhesion).

7. Collective amendments to Regulations Nos. 41, 51 and 59.
8. Exchange of information on national and international requirements on noise levels.
9. Influence of road surface on tyre rolling sound emissions.
10. Quiet Road Transport Vehicles.
11. Environmentally Friendly Vehicles.
12. Other business.

# Annexes

## Annex I

### List of informal documents (GRB-52-…) distributed during the session

| *No.* | *Transmitted by* | *Agenda item* | *Language* | *Title* | *Follow-up* |
|---|---|---|---|---|---|
| 1 | United Kingdom/ Japan | 14 | E | Guidelines on establishing requirements for high-priority warning signals | (a) |
| 2 | ISO | 3(a) | E | ISO 10844 test track revision | (a) |
| 3 | Japan | 10 | E | Guidelines on measures against the quietness of hybrid vehicles, etc. | (a) |
| 4 | OICA | 3(a) | E | Noise emissions of moving vehicles in urban areas | (a) |
| 5 | ETRTO | 6(a) | E | Regulation No. 117 (Tyre rolling noise and wet grip adhesion): Proposal for amendments to ECE/TRANS/WP.29/2010/63 | (b) |
| 6 | ETRTO | 6(b) | E | Regulation No. 117: Proposal for amendments to ECE/TRANS/WP.29/GRB/2010/8 | (a) |
| 7 | EC | 3(b) | E | Draft report on Vehicle Noise Limit Values (VENOLIVA): Comparison of two noise mission test methods | (a) |
| 8 | CLEPA | 10 | E | Raising the vulnerable public's awareness to recognize quiet road transport vehicles | (a) |
| 9 | Chair | 3(c) | E | ASEP outline: Summary and conclusions | (a) |
| 10 | Russian Federation | 6(a) | E | Proposal for draft amendments to Regulation No. 117 | (a) |
| 11 | OICA | 3(b) | E | OICA comments on the presentation of TNO interim report in June 2010 about the monitoring data for the new type approval test method in ECE Regulation No. 51 | (a) |

| *No.* | *Transmitted by* | *Agenda item* | *Language* | *Title* | *Follow-up* |
|---|---|---|---|---|---|
| 12 | OICA | 3(c) | E | OICA statement concerning the Chair's proposal on ASEP (document ECE/TRANS/WP.29/GRB/2010/9) | (a) |
| 13 | EC | 3(b) | E | VENOLIVA: Vehicle Noise Limit Values – GRB presentation on final results | (a) |
| 14 | EC | 3(b) | E | Impact assessment of the policy options: Venoliva study | (a) |
| 15 | Netherlands | 3(c) | E | ASEP Stringency analysis: Updated with the proposals of TNO and the GRB Chair | (a) |
| 16 | QRTV Chair | 10 | E | QRTV report to GRB, 7 September 2010 | (a) |
| 17 | United States of America | 10 | E | Incidence of pedestrian and bicyclist crashes by hybrid electric passenger vehicles | (a) |
| 18 | Japan | 10 | E | Approaching Vehicle Audible System (AVAS) | (a) |
| 19 | CLEPA | 10 | E | The hazards of EVs: Solving silence with sound | (a) |
| 20 | Netherlands | 3(a) | E | Netherlands position with respect to ISO 10844 update | (a) |

Notes:

(a) Consideration completed or to be superseded.

(b) Resume consideration on the basis of an official document.

## Annex II

### GRB informal groups

| Informal group | Chair(s) | Secretary |
|---|---|---|
| Motorcycle noise emissions (Regulation No. 41) | Mr. A. Erario (Italy)<br>Tel: +39 06 4158 6228<br>Fax: +39 06 4158 3253<br>E-mail: antonio.erario@mit.gov.it | Mr. N. Rogers (IMMA)<br>Tel: +41 22 920 2123<br>Fax: +41 22 920 2121<br>E-mail: nickrogers@immamotorcycles.org |
| Additional Sound Emission Provisions (ASEP) | Mr. B. Kortbeek (Netherlands)<br>Tel: +31 70 339 4526<br>Fax: +31 70 339 1280<br>E-mail: boudewijn.kortbeek@minvrom.nl | Mr. H.P. Bietenbeck (OICA)<br>Tel.: +49 221 90 32 409<br>Fax : +49 221 90 32 546<br>E-mail: hbietenb@ford.com |
| Special Tyre Definitions (STD) | Mr. W. Schneider (EC)<br>Tel: +32 2 2965260<br>Fax: +32 2 2969637<br>E-mail: wolfgang.schneider@ec.europa.eu | Mr. I. Knowles (EC)<br>Tel: +32 2 2957680<br>Fax: +32 2 2969637<br>E-mail: ian.knowles@ec.europa.eu |
| Quiet road transport vehicles (QRTV) | Mr. K. Feith (USA)<br>Tel: +1 202 5641679<br>Fax: +1 202 5641545<br>E-mail: feith.ken@epa.gov | Mr. F. Guichard (OICA)<br>Tel: +49 7031-90-40240<br>Fax: + 49 7031-90-40265<br>E-mail: francois.guichard@daimler.com |
| Environmentally Friendly Vehicles (EFV) | Mr. A. Sharma (India) (Chair)<br>Tel: +91 11 23063733<br>Fax: +91 11 23061785<br>E-mail: ambujsharma@nic.in<br>Mr. S. Marathe (India) (Co-chair)<br>Tel: +91 20 30231100<br>Fax: +91 20 25434190<br>E-mail: srmarathe@araiindia.com | Mr. V. Gulati (India)<br>Tel: +91 11 23062714<br>Fax: +91 11 203062714<br>E-mail: vikramgulati11@rediffmail.com |

# Annex III

## Informative document regarding additional provisions on rolling resistance, complementing the 02 series of amendments to Regulation No. 117

**A. Procedure for inter-laboratory comparison for rolling resistance**

**1. General**

**1.1.** This clause describes the procedure to be followed to perform an inter-laboratory comparison. The collected data can be used to define a reference based upon multiple [Technical Service]/[test laboratory] machines for the purpose of chapter B of this annex. They can also be used for:

(a) the determination of the actual number N ($N \geq 5$) of tyres to be used for the purpose of chapter B of this annex,

(b) the selection of the nominal value of the N tyres to be used,

(c) the determination of assigned values (see paragraph 1.3. below) for a set of tyres, as defined in paragraph 2. of chapter A to this annex.

**1.2.** This annex is not mandatory for Type Approval.

**1.3.** This procedure requires a set of at least five appropriately selected tyres. The $C_r$ results of each selected tyre measured by each [Technical Service] /[test laboratory] participating to the inter-laboratory comparison according to an applicable standard (e.g ISO 5725) can be used for determining the $C_r$ assigned value for each selected tyre.

Every [Technical Service]/[test laboratory] machine participating to the inter-laboratory comparison shall be in accordance with Annex 6 of Regulation No. 117, 02 series of amendments.

**1.4.** The assigned value for each reference tyre is the general average of the results obtained by all [Technical Services]/[test laboratories] for this reference tyre in this inter-laboratory comparison.

**1.5.** According to paragraph 5.1. of chapter B of this annex, a [Technical Service's]/[test laboratory's] inter-laboratory alignment formula can be established and can be used to translate the results obtained on the different [Technical Service]/[test laboratory] machines into aligned results of each [Technical Service]/[test laboratory], in order to provide assigned values to candidate machines when aligning with one [Technical Service]/[test laboratory].

**2. Tyre selection requirements**

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

(a) $C_r$ 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.**

**and $C_r$ values shall have a minimum range, between maximum $C_r$ value and minimum $C_r$ value of the alignment tyres, of:**

**3 N/kN for Class C1 and C2 tyres, and**

**2 N/kN for Class C3 tyres.**

**$C_r$ values shall be distributed uniformly.**

**(b) The selected tyre section width shall 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 shall be:**

**between 510 to 800 mm for machines for Class C1 and C2, and**

**between 771 to 1143 mm for machines for Class C3.**

**(d) Load index values shall adequately cover the range for the tyres to be tested, ensuring that the $F_r$ 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:**

**(a) at least five selected tyres for Class C1 and C2 tyres, and**

**(b) at least five selected tyres for Class C3 tyres.**

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

**(a) it shows a condition which makes it unusable for further tests, and/or**

**(b) there are deviations of $C_r$ for measurement greater than 1.5 per cent relative to earlier measurements after correction for any machine drift.**

**3. [Technical Service]/[test laboratory] inter laboratory comparison frequency**

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

**4. Evolution of the list of participating [Technical Services]/[test laboratories]**

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

**A [Technical Service]/[test laboratory] entitled and willing to participate will receive a selected tyre set, measure it according to Annex 6 of Regulation No. 117, 02 series of amendments, and get aligned according to chapter B of this annex using the existing assigned values for each tyre.**

**5. Procedure for [Technical Services]/[test laboratories] participating to the inter-laboratory comparison**

**(a) Each time a 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 to Regulation No. 117 shall be followed again.**

**(b) A list of all [Technical Services]/[test laboratories] willing to be part of the inter-laboratory comparison for the definition of the assigned values is established. Each [Technical Service]/[test laboratory] shall measure each alignment tyre three times in accordance with section 4 of Annex 6 to Regulation No. 117 and applying the conditions in section 3 of the same Annex 6, provide the individual values corrected for a temperature of 25 °C and a drum diameter of 2 m, the mean value and standard deviation established from the 3 measurements for each tyre.**

**(c) The measured standard deviation $\sigma_m$ for different classes of tyre shall be as follows:**

**not greater than 0.05 N/kN for class C1 and C2 tyres, and**

**not greater than 0.05 N/kN for class C3 tyres.**

**(d) The average of the values given by all the participating [Technical Services]/[test laboratories] for each tyre is taken as the assigned value for this tyre.**

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

$$C_r\_ass = A1_i \times C_r\_TS_i + B1_i$$

**where:**

**$C_r$_ass is the assigned value of the rolling resistance coefficient;**

**$C_r$_$TS_i$ is the measured value of the rolling resistance coefficient by [Technical Service]/[test laboratory] "i", including temperature and drum diameter influences.**

**The aligned $C_r$ value for the [Technical Service]/[test laboratory] shall take into account coefficients $A1_i$ and $B1_i$.**

**B. Procedure for measurement machines alignment and monitoring requirements for rolling resistance**

**1. Definitions**

**1.1. Alignment tyres**

**A common set of at least five different tyres, conforming to the specification of paragraph 2. of chapter A of this annex, which are the same identical tyres measured by both the candidate and [Technical Service]/[test laboratory] machines shall be used to perform the 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. This annex is not mandatory for Type Approval.**

**2.2. The machine alignment procedure requires at least five alignment tyres used by the candidate laboratory operating the machine. These tyres are used to align candidate machine(s) by comparing the measured $C_r$ results to the ones obtained by a [Technical Service]/[test laboratory] 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]/[test laboratory] it chose to perform the alignment.**

**3. Conditions for candidate machine**

**The candidate machine shall be in accordance with Annex 6 of Regulation No. 117, 02 series of amendments.**

**4. Alignment tyre requirements**

**4.1. 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) $C_r$ values shall have a gap between two alignment 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.**

**and $C_r$ values shall have a minimum range, between maximum $C_r$ value and minimum $C_r$ value of the alignment tyres, of:**

**3 N/kN for Class C1 and C2 tyres, and**

**2 N/kN for Class C3 tyres.**

**$C_r$ values shall be distributed uniformly.**

**(b) The alignment tyre section width shall 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 shall be:**

**between 510 to 800 mm for machines for Class C1 and C2 tyres, and**

**between 771 to 1143 mm for machines for Class C3 tyres.**

**(d) Load index values shall adequately cover the range for the tyres to be tested, ensuring that the $F_r$ 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:**

**(a) at least five alignment tyres for Class C1 and C2 tyres, and**

**(b) 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, and/or**

**(b) there are deviations of $C_r$ for alignment tyre measurement greater than 1.5 per cent relative to earlier measurements after correction for any machine drift.**

**5. Alignment procedure**

**5.1. Alignment procedure for [Technical Services]/[test laboratories] participating to the inter-laboratory comparison (paragraph 1.2. of chapter A of this annex)**

**Each [Technical Service]/[test laboratory] "i" shall correlate its measurements with the assigned values as defined in paragraph 5. of chapter A of this annex.**

**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 to Regulation No. 117 shall be followed again. This requirement applies to both the [Technical Service]/[test laboratory] and the candidate laboratory.**

**(b) The [Technical Service]/[test laboratory] shall measure each alignment tyre three times in accordance with paragraph 4. of Annex 6 to Regulation No. 117 and applying the conditions in paragraph 3. of the same Annex 6, and provides the individual values corrected for a temperature of 25°C and a drum diameter of 2 m, the mean value and standard deviation established from the 3 measurements for each tyre.**

**(c) The candidate machine shall measure each alignment tyre three times in accordance with paragraph 4 of Annex 6 to Regulation No. 117 and applying the conditions in paragraph 3. of the same Annex 6, with a measurement standard deviation for each tyre of:**

**(i) not greater than 0.075 N/kN for Class C1 and C2 tyres, and**

**(ii) 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.**

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

$$C_r\_TS_i = A2 \times C_r\_CM + B2$$

**where:**

**$C_r$_$TS_i$** **is the measured value of the rolling resistance coefficient by [Technical Service]/[test laboratory] 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 measurement standard deviation estimate $\sigma_m$ will also be given.**

**5.3.** **The alignment process shall be repeated at least every second year and always after any significant machine change or any drift in machine control tyre monitoring data.**"