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Working Party on Brakes and Running Gear (GRRF)

**REPORT OF THE WORKING PARTY ON BRAKES AND RUNNING GEAR (GRRF)
ON ITS FIFTY-NINTH SESSION**

(30 January – 3 February 2006)

Addendum 1

Annex 5

DRAFT 01 SERIES OF AMENDMENTS TO REGULATION No. 117 (Tyre rolling sound)
(This text was adopted by GRRF at its fifty-ninth session, see para. 22).

The title of Regulation, amend to read:

"UNIFORM PROVISIONS CONCERNING THE APPROVAL OF TYRES WITH REGARD TO
ROLLING SOUND EMISSIONS AND TO ADHESION ON WET SURFACES"

The list of contents, the Annexes, amend to read:

"

Annex 4: Specifications for the test site

Annex 5: Test procedure for measuring wet grip"

Paragraphs 1. and 1.1., amend to read:

"1. SCOPE

1.1. This Regulation applies to tyres with regard to their sound emissions and to class C1 tyres for M₁, N₁, O₁ or O₂ */ vehicles with regard to adhesion performance on wet surfaces (wet adhesion)."

Insert a new paragraph 1.2., to read:

"1.2. Contracting Parties shall issue or accept approvals to rolling sound and wet adhesion unless they notify to the Secretary-General of the United Nations their option for rolling sound only. Such notification shall have effect in accordance with the time scales laid down in Article 1, paragraphs 6. and 7. of the 1958 Agreement (E/ECE/TRANS/505/Rev.2)."

Paragraph 2.1., item (v), amend to read:

"(v) for Class C1 tyres:

- in case of tyres submitted for approval of rolling sound emission levels, whether normal or reinforced (or extra load);
- in case of tyres submitted for approval of performance adhesion on wet surfaces, whether normal or snow tyres with a speed category of Q or below (160 km/h) or speed category R and above including H (≥ 170 km/h)."

Paragraph 2.5., amend to read:

"2.5. "Representative tyre size" means the tyre in Annex 3 to this Regulation with regard to rolling sound emissions, and Annex 5 for adhesion on wet surfaces, to assess the conformity"

Insert new paragraphs 2.11. to 2.18., to read:

"2.11. "Adhesion on wet surfaces" means the relative braking performance, on a wet surface, of a test vehicle equipped with the candidate tyre in comparison to that of the same test vehicle equipped with a reference tyre (SRTT).

2.12. "Standard reference test tyre (SRTT)" means a tyre that is produced, controlled and stored in accordance with the American Society for Testing and Materials (ASTM) standard E 1136 - 93 (re-approved 1998).

2.13. "Candidate tyre" means a tyre, representative of the type, that is submitted for approval in accordance with this Regulation.

2.14. "Control tyre" means a normal production tyre that is used to establish the wet grip performance of tyre sizes unable to be fitted to the same vehicle as the standard reference test tyre – see paragraph 2.2.2.16. of Annex 5 to this Regulation.

- 2.15. "Wet grip index ("G")" means the ratio between the performance of the candidate tyre and the performance of the standard reference test tyre.
- 2.16. "Peak brake force coefficient ("pbfc")" means the maximum value of the ratio of braking force to vertical load on the tyre prior to wheel lock-up.
- 2.17. "Mean fully developed deceleration ("mfdd")" means the average deceleration calculated on the basis of the measured distance recorded when decelerating a vehicle between two specified speeds.
- 2.18. "Coupling (hitch) height" means the height when measured perpendicularly from the centre of the articulation point of the trailer towing coupling or hitch to the ground, when the towing vehicle and trailer are coupled together. The vehicle and trailer must be standing on level pavement surface in its test mode complete with the appropriate tyre(s) to be used in the particular test."

Paragraph 3.1., amend to read:

- "3.1. The application for approval of a type of tyre with regard to this Regulation shall be submitted by the tyre manufacturer or by his duly accredited representative. It shall specify:"

Insert a new paragraph 3.1.1., to read:

- "3.1.1. The performance characteristics to be assessed for the tyre type; "rolling sound emissions level" or "adhesion performance level on wet surfaces and rolling sound emissions level";"

Paragraphs 3.1.1. to 3.1.5. (former), renumber as paragraphs 3.1.2. to 3.1.6.

Paragraph 3.1.5.1. (former), renumber as paragraph 3.1.6.1. and amend to read:

- "3.1.6.1. Section width range for class C1 tyres (see paragraph 6.1.1. of this Regulation);

NOTE: This information is required only for approval with regard to rolling sound emission level".

Paragraph 3.1.6. (former), renumber as paragraph 3.1.7.

Paragraph 3.1.7. (former), renumber as paragraph 3.1.8. and amend to read:

- "3.1.8. for Class C1 tyres, state whether:
- reinforced (or extra load) in case of approval with regard to rolling sound emission level;
 - speed category symbol "Q" or below (not including "H") or "R" and above (including "H") in case of "snow" tyres for approval with regard to adhesion on wet surfaces;"

Paragraphs 3.1.8. and 3.1.9. (former), renumber as paragraphs 3.1.9. and 3.1.10.

Paragraph 3.2.1., amend to read:

"3.2.1. Details of the major features, with respect to the effects on tyre performance (i.e. rolling sound emission level or adhesion on wet surfaces, respectively) of the tread pattern(s) to be used on the designated range of tyre sizes. This may be by drawing, photograph or description, but must be sufficient to allow the type approval authority or technical service to determine whether any subsequent changes to the major features will adversely affect the tyre performance. The effects of changes to minor details of tyre construction on tyre performances will be evident and determined during checks on conformity of production."

Insert new paragraphs 5.3.1., 5.3.1.1., 5.3.1.2. and 5.3.2., to read:

"5.3.1. Tyre manufacturers are entitled to submit an application for extension of type approval to the requirements of other regulations relevant to the tyre type. In that case, a copy of the relevant type approval communication(s), as issued by the relevant type approval authority, shall be attached to the application for extension of approval. All applications for extension of approval(s) shall only be granted by the type approval authority which issued the original approval for the tyre.

5.3.1.1. When extension of approval is granted to incorporate into the communication form (see Annex 1 to this Regulation) certification(s) of conformity to other regulations, the approval number on the communication form shall be supplemented by suffix(es) to identify the given regulation(s) and the technical prescriptions which have been incorporated by the extension of approval. In relation to each given suffix, the specific type approval number(s) and the Regulation itself shall be added to paragraph 9. of the communication form.

5.3.1.2. The suffix shall identify the series of amendments of the prescription on tyre performances for the relevant Regulation (e.g. S01 or SW01 to identify the first series of amendments on tyre road rolling sound emissions or both tyre road rolling sound emissions and tyre adhesion on wet surfaces). No identification to the series of amendments shall be required if the relevant Regulation is in its original form.

5.3.2. The following suffixes have been already reserved to identify specific regulations on tyre performance parameters:

S to identify additional conformity to the requirements on tyre rolling sound emissions,
W to identify additional conformity to the requirements on tyre adhesion on wet surfaces,

other suffixes will be defined on need."

Paragraph 5.4.2., amend to read:

"5.4.2. the approval number, followed by suffix(es) "S" or "SW", placed to the right (or below) the circle prescribed in paragraph 5.4.1., if part of the original approval. If the approval is extended subsequent to the original approval the addition sign "+" shall be placed in front of the "S" or "SW" to denote an extension to the approval."

Insert new paragraphs 5.4.3. and 5.4.4., to read:

"5.4.3. The suffix(es), and the identification to any relevant series of amendments, if any, as specified in the communication form.

5.4.4. The marking on the tyre sidewalls of suffix(es) to the approval number removes the requirement for any additional marking on the tyre of the specific type approval number for conformity to the regulation(s) to which the suffix refers as per paragraph 5.3.2. above."

Insert new paragraphs 6.2. and 6.2.1., to read:

"6.2. The wet grip performance will be based on a procedure that compares either peak brake force coefficient ("pbfc") or mean fully developed deceleration ("mfdd") against values achieved by a standard reference test tyre (SRTT). The relative performance shall be indicated by a wet grip index (G).

6.2.1. For Class C1 tyres, tested in accordance with either procedure given in Annex 5 to this Regulation, the tyre shall meet the following requirements:

Category of use	Wet grip index (G)
snow tyre with a speed symbol ("Q" or below minus "H") indicating a maximum permissible speed not greater than 160 km/h	≥ 0.9
snow tyre with a speed symbol ("R" and above, plus "H") indicating a maximum permissible speed greater than 160 km/h	≥ 1.0
normal (road type) tyre	≥ 1.1

Paragraphs 7.1. and 7.1.1., amend to read:

"7.1. Every modification of the type of tyre, which may influence the performance characteristics approved in accordance with this Regulation, shall be notified to the type approval authority which approved the type of tyre. The authority may either:

7.1.1. Consider that the modifications are unlikely to have any appreciable adverse effect on the performance characteristics approved and that the tyre will comply with the requirements of this Regulation; or"

Paragraph 8.1., amend to read:

"8.1. Any tyre approved under this Regulation shall be so manufactured as to conform to the performance characteristics of the type of tyre approved and satisfy the requirements of paragraph 6. above."

Insert a new paragraph 8.2.1., to read:

"8.2.1. In the case of verifications with regard to approvals in accordance with paragraph 6.2., these shall be carried out using the same procedure (see Annex 5 to this Regulation) as that adopted for original approval, and the type approval authority shall satisfy itself that all tyres falling within an approved type comply with the approval requirement. The assessment shall be based upon the production volume of the tyre type at each manufacturing facility, taking into account the quality management system(s) operated by the manufacturer. Where the test procedure involves testing a number of tyres at the same time, for example a set of four tyres for the purpose of testing wet grip performance in accordance with the standard vehicle procedure given in Annex 5 to this Regulation, then the set shall be considered as being one unit for the purposes of calculating the number of tyres to be tested."

Insert a new Paragraph 12.3., to read:

"12.3. As from 24 months after the date of entry into force of the 01 series of amendments, Contracting Parties applying this Regulation with respect to the adhesion level of tyres in rolling conditions on wet surfaces shall grant approvals only if the tyre type to be approved meets the requirements of this Regulation as amended by the 01 series of amendments."

Paragraphs 12.3. and 12.4. (former), renumber as paragraphs 12.4. and 12.5.

Annex 1,

The introductory paragraph, amend to read:

"
.....
of a type of tyre with regard to "rolling sound emission level" and "adhesion performance on wet surfaces" pursuant to Regulation No. 117."

Item 6., amend to read:

"6. Sound level RegulationNo. 117, as per item 7. of the test report in the appendix to Annex 3: dB(A) at"

Insert a new item 7., to read:

"7. Wet adhesion level of the representative tyre size, see paragraph 2.5. of Regulation No. 117, as per item 7. of the test report in the appendix to Annex 5: (G) using vehicle or trailer method 2."

Items 7. to 14.1. (former), renumber as items 8. to 15.1.

Item 14.2. (former), renumber as item 15.2., and amend to read:

"15.2. A list of tread-pattern designations: Specify for each trademark or brand name and trade description the list of tyre size designations, adding in case of Class C1 tyres the mark "reinforced" (or "extra load") or the speed symbol of snow tyres, if so required by paragraph 3.1. of this Regulation."

Annex 2, amend to read:

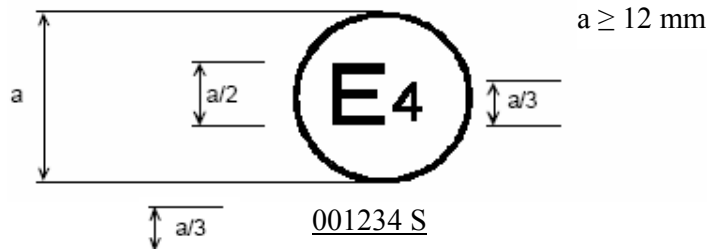
"Annex 2

ARRANGEMENT OF APPROVAL MARKS

(See paragraph 5.4. to this Regulation)

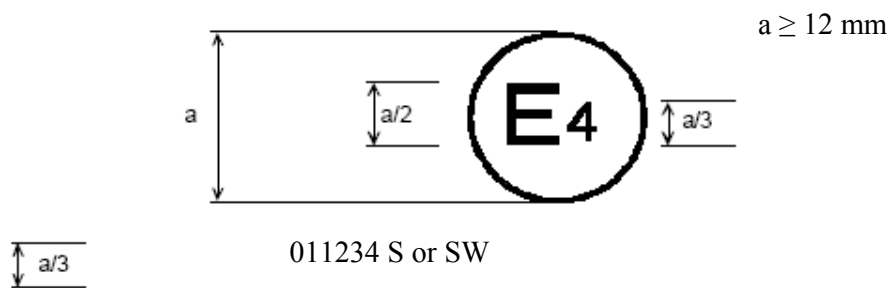
Approval marks in accordance with Regulation No. 117

Example 1



The above approval mark, affixed to a pneumatic tyre shows that a tyre concerned has been approved in the Netherlands (E4) pursuant to Regulation No. 117 (marked by S (rolling sound) only), under approval number 001234. The first two digits of the approval number (00) indicate that the approval was granted according to the requirements of this Regulation in its original form.

Example 2

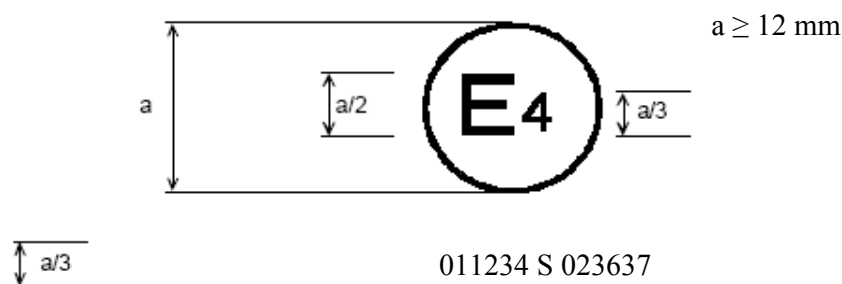


The above approval mark shows that the tyre concerned has been approved in the Netherlands (E4) pursuant to Regulation No. 117 (marked by S (rolling sound) or both S (rolling sound) and W (wet adhesion), under approval number 011234. This indicates that the approval is for S or both SW. The first two digits of the approval number (01) indicate that the approval was granted according to the 01 series of amendments.

Appendix 1

Approval according to Regulation No. 117 coincident with approval
to Regulation Nos. 30 or 54 1/

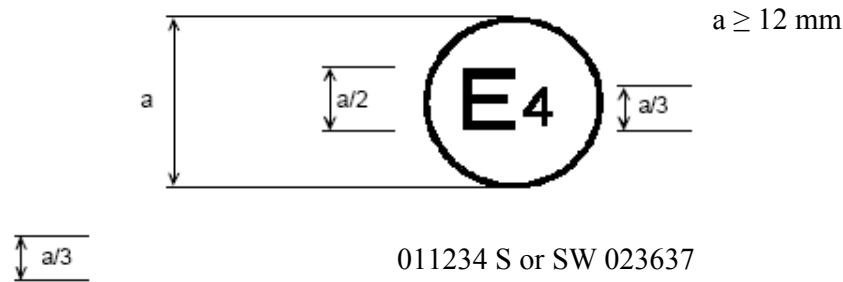
Example 1



The above approval mark shows that the tyre concerned has been approved in the Netherlands (E4) pursuant to Regulation No. 117 (marked by S (rolling sound)), under approval number 011234 and Regulation No. 30, under approval number 023637. The first two digits of the approval number (01) indicate that the approval was granted according to the 01 series of amendments, but Regulation No. 30 included the 02 series of amendments.

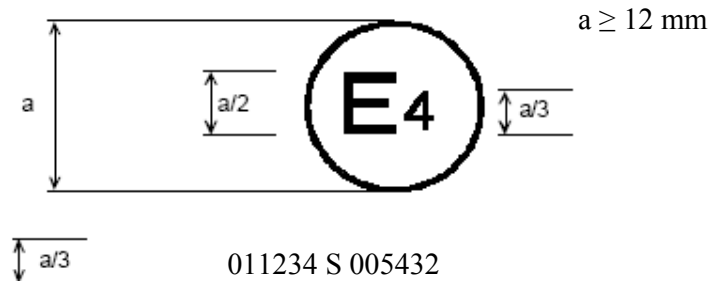
1/ Approvals in accordance with Regulation No. 117 for tyres within the scope of Regulation No. 54 currently do not include wet adhesion requirements.

Example 2



The above approval mark shows that the tyre concerned has been approved in the Netherlands (E4 pursuant to Regulation No. 117 (marked by S (rolling sound) or SW (rolling sound and wet adhesion)), under approval number 011234 and Regulation No. 30 under approval number 023637. The first two digits of the approval number (01) indicate that the approval was granted according to the 01 series of amendments, but Regulation No. 30 included the 02 series of amendments.

Example 3

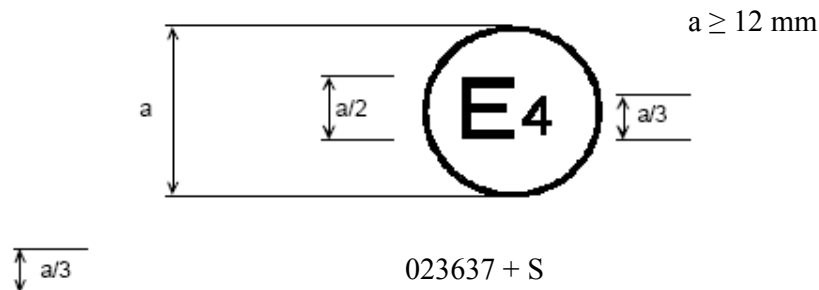


The above approval mark shows that the tyre concerned has been approved in the Netherlands (E4 pursuant to Regulation No. 117 and the 01 series of amendments under approval number 011234 (marked by S only), and Regulation No. 54. This indicates that the approval is for rolling sound (S) only, as Regulation No. 54 approved tyres at present cannot be approved for wet adhesion. The first two digits of the Regulation No. 117 approval number (01) in conjunction with 'S' indicate that the first approval was granted in accordance with Regulation No. 117 which included the 01 series of amendments. The first two digits of Regulation No. 54 (00) indicates that this Regulation was in its original form.

Appendix 2

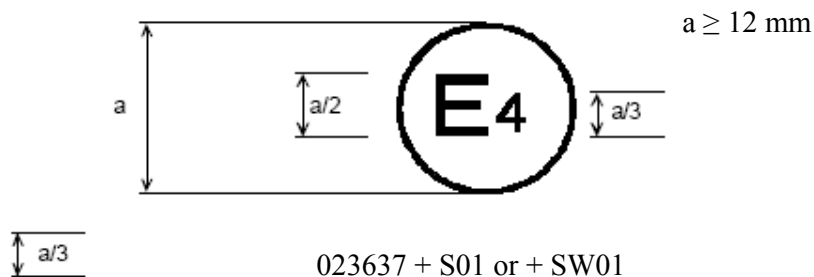
Extensions to combine approvals issued in accordance with Regulations Nos. 117, 30 or 54 2/

Example 1



The above approval mark shows that the tyre concerned has been initially approved in the Netherlands (E4) pursuant to Regulation No. 30 and the 02 series of amendments under approval number 023637. It is also marked by + S (rolling sound) which indicates that its approval is extended under Regulation No. 117. The first two digits of the approval number (02) indicate that the approval was granted according to Regulation No. 30 which included the 02 series of amendments. The addition (+) sign indicates that the first approval was granted in accordance with Regulation No. 30 and has been extended to include Regulation No. 117 approval(s).

Example 2



The above approval mark shows that the tyre concerned has been initially approved in the Netherlands (E4) pursuant to Regulation No. 30 and the 02 series of amendments under approval number 023637. This indicates that the approval is for S (rolling sound) or S (rolling sound) and W (wet adhesion). The S or SW followed by (01) indicates that it has had its approval extended under Regulation No. 117 which included the 01 series of amendments. The first two digits of the approval number (02) indicate that the approval was granted according to Regulation No. 30 which included the 02 series of amendments. The addition (+) sign indicates that the first approval was granted in accordance with Regulation No. 30 and has been extended to include Regulation No. 117 approval(s)."

2/ Approvals in accordance with Regulation No. 117 for tyres within the scope of Regulation No. 54 currently do not include wet adhesion requirements.

Insert a new Annex 5, to read:

"Annex 5

TEST PROCEDURE FOR MEASURING WET GRIP

1. GENERAL TEST CONDITIONS

1.1. Track characteristics

The track shall have a dense asphalt surface with a gradient in any direction not exceeding 2 per cent. It shall be of uniform age, composition, and wear and shall be free of loose material or foreign deposits. The maximum chipping size shall be 10 mm (tolerances permitted from 8 mm to 13 mm) and the sand depth measured as specified in ASTM E-965 shall be 0.7 ± 0.3 mm.

The surface friction value for the wetted track shall be established by one or other of the following methods:

1.1.1. Standard reference test tyre (SRTT) method

When tested using the SRTT and the method given in paragraph 2.1. the average peak brake force coefficient (pbfc) shall be between 0.6 and 0.8. The measured values shall be corrected for the effects of temperature as follows:

$$\text{pbfc} = \text{pbfc (measured)} + 0.003 \cdot 5(t - 20)$$

where "t" is the wetted track surface temperature in degrees Celsius.

The test shall be conducted using the lanes and length of the track to be used for the wet grip test.

1.1.2. British pendulum number (BPN) method

The averaged British pendulum number (BPN) of the wetted track, measured in accordance with the procedure given in the American Society for Testing and Materials (ASTM) standard 303-93 (re-approved 1998) and using the pad as specified in ASTM standard E 501-94, shall be between 40 and 60 after temperature correction. Unless temperature correction recommendations are indicated by the pendulum manufacturer, the following formula can be used:

$$\text{BPN} = \text{BPN (measured value)} + 0.34 \cdot t - 0.0018 \cdot t^2 - 6.1$$

where "t" is the wetted track surface temperature in degrees Celsius.

In the lanes of the track to be used during the wet grip tests, the BPN shall be measured at intervals of 10 m along the length of the lanes. The BPN shall be measured 5 times at

each point and the coefficient of variation of the BPN averages shall not exceed by 10 per cent.

1.1.3. The type approval authority shall satisfy itself of the characteristics of the track on the basis of evidence produced in test reports.

1.2. Wetting conditions

The surface may be wetted from the track-side or by a wetting system incorporated into the test vehicle or the trailer.

If a track-side system is used, the test surface shall be wetted for at least half an hour prior to testing in order to equalize the surface temperature and water temperature. It is recommended that track-side wetting be continuously applied throughout testing.

The water depth shall be between 0.5 and 1.5 mm.

1.3. The wind conditions shall not interfere with wetting of the surface (wind-shields are permitted).

The wetted surface temperature shall be between 5 °C and 35 °C and shall not vary during the test by more than 10 °C.

2. TEST PROCEDURE

The comparative wet grip performance shall be established using either:

- a trailer or special purpose tyre evaluation vehicle, or
- a standard production passenger carrying vehicle (M₁ category as defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.) contained in document TRANS/WP.29/78/Rev.1/Amend.2).

2.1. Trailer or special purpose tyre evaluation vehicle procedure

2.1.1. The trailer, together with the towing vehicle, or the tyre evaluation vehicle shall comply with the following requirements:

2.1.1.1. Be capable of exceeding the upper limit for the test speed of 67 km/h and of maintaining the test speed requirement of 65 ± 2 km/h at the maximum level of application of braking forces.

2.1.1.2. Be equipped with an axle providing one test position having an hydraulic brake and actuation system that can be operated from the towing vehicle if applicable. The braking system shall be capable of providing sufficient braking torque to achieve the peak brake force coefficient over the range of tyre sizes and tyre loads to be tested.

2.1.1.3. Be capable of maintaining longitudinal alignment (toe) and camber of the test wheel

and tyre assembly throughout the test within $\pm 0.5^\circ$ of the static figures achieved at the test tyre loaded condition.

- 2.1.1.4. In the case of a trailer, the mechanical coupling device between the towing vehicle and trailer shall be such that, when the towing vehicle and trailer are coupled together, the drawbar, or part of the drawbar, of a trailer that incorporates the braking force measurement sensing is horizontal or slopes downwards from rear to front at a maximum angle of 5° . The longitudinal distance from the centre line of the articulation point of the coupling (hitch) to the transverse centre line of the axle of the trailer shall be at least ten times the coupling (hitch) height.
- 2.1.1.5. In the case of vehicles that incorporate a track wetting system, the water delivery nozzle(s) shall be such that the resulting water film is of uniform section extending at least 25 mm beyond the width of the tyre contact patch. The nozzle(s) shall be directed downwards at an angle of 20° to 30° and shall contact the track surface between 250 mm and 450 mm in front of the centre of the tyre contact patch. The height of the nozzle(s) shall be 25 mm or the minimum to avoid any obstacles on the track surface without exceeding a maximum of 100 mm. Water delivery rate shall ensure a water depth of 0.5 mm to 1.5 mm and shall be consistent throughout the test to within ± 10 per cent. Note that a typical rate for testing at 65 km/h will be 18 l s^{-1} per metre of wetted track surface width.

The system shall be able to deliver the water such that the tyre, and track surface in front of the tyre, is wetted before the start of braking and throughout the duration of the test.

2.1.2. Test procedure

- 2.1.2.1. The test tyre shall be trimmed to remove any moulding protrusions that are likely to affect the test.
- 2.1.2.2. The test tyre shall be mounted on the test rim declared by the tyre manufacturer in the approval application and shall be inflated to 180 kPa in the case of the SRTT and standard load tyre or 220 kPa in the case of a reinforced or extra load tyre.
- 2.1.2.3. The tyre shall be conditioned for a minimum of two hours adjacent to the test track such that it is stabilized at the ambient temperature of the test track area. The tyre(s) shall not be exposed to direct sunshine during conditioning.
- 2.1.2.4. The tyre shall be loaded to:
- between 445 kg and 508 kg in the case of the SRTT and
 - between 70 per cent and 80 per cent of the load value corresponding to the load index of the tyre in any other case.
- 2.1.2.5. Shortly before testing, the track shall be conditioned by carrying out at least ten

braking tests on the part of the track to be used for the performance test programme but using a tyre not involved in that programme.

- 2.1.2.6. Immediately prior to testing, the tyre inflation pressure shall be checked and reset, if necessary, to the values given in paragraph 2.1.2.2.
- 2.1.2.7. The test speed shall be between 63 km/h and 67 km/h and shall be maintained between these limits throughout the test run.
- 2.1.2.8. The direction of the test shall be the same for each set of tests and shall be the same for the test tyre as that used for the SRTT with which its performance is to be compared.
- 2.1.2.9. The brakes of the test wheel assembly shall be applied such that peak braking force is achieved within 0.2 s and 0.5 s of brake application.
- 2.1.2.10. In the case of a new tyre, two test runs shall be carried out to condition the tyre. These tests may be used to check the operation of the recording equipment but the results shall not be taken into account in the performance assessment.
- 2.1.2.11. For the evaluation of the performance of any tyre compared with that of the SRTT, the braking test shall be carried out from the same point and in the same lane of the test track.
- 2.1.2.12. The order of testing shall be:

R1 – T – R2

where:

R1 is the initial test of the SRTT, R2 is the repeat test of the SRTT and T is the test of the candidate tyre to be evaluated,

A maximum of three candidate tyres may be tested before repeating the SRTT test, for example:

R1–T1 – T2 – T3 – R2

- 2.1.2.13. The average value of peak brake force coefficient (pbfc) shall be calculated over at least six valid results.

For results to be considered to be valid, the coefficient of variation as determined by the standard deviation divided by the average result, expressed as a percentage, shall be within 5 per cent. If this is cannot achieved with the repeat testing of the SRTT, the evaluation of the candidate tyre(s) shall be discarded and the entire order of testing shall be repeated.

- 2.1.2.14. Using the value of the average pbfc for each series of test runs:

In the case of the order of testing R1 – T – R2, the pbfc of the SRTT to be used in the comparison of the performance of the candidate tyre shall be taken to be:

$$(R1 + R2)/2$$

where:

R1 is the average pbfc for the first series of test runs of the SRTT and R2 is the average pbfc for the second series of test runs of the SRTT.

In the case of the order of testing R1 – T1 – T2 – R2, the pbfc of the SRTT shall be taken to be:

$$2/3 R1 + 1/3 R2 \text{ for comparison with the candidate tyre T1 and}$$

$$1/3 R1 + 2/3 R2 \text{ for comparison with the candidate tyre T2}$$

In the case of the order of testing R1 – T1 – T2 – T3 – R2, the pbfc of the SRTT shall be taken to be:

$$3/4 R1 + 1/4 R2 \text{ for comparison with the candidate tyre T1;}$$

$$(R1 + R2)/2 \text{ for comparison with the candidate tyre T2 and}$$

$$1/4 R1 + 3/4 R2 \text{ for comparison with the candidate tyre T3}$$

2.1.2.15. The wet grip index (G) shall be calculated as:

$$G = \frac{\text{pbfc of candidate tyre}}{\text{pbfc of SRTT}}$$

2.2. Standard vehicle procedure

2.2.1. The vehicle shall be a standard M₁ category vehicle, capable of a minimum speed of 90 km/h and equipped with an anti-lock braking system (ABS).

2.2.1.1. The vehicle shall not be modified except:

- to allow the fitting of an increased range of wheel and tyre sizes
- to allow mechanical (including hydraulic, electrical or pneumatic) operation of the service brake control. The system may be operated automatically by signals from devices incorporated in, or adjacent to, the track.

2.2.2. Test procedure

2.2.2.1. The test tyres shall be trimmed to remove any moulding protrusions that are likely to affect the test.

2.2.2.2. The test tyre shall be mounted on the test rim declared by the tyre manufacturer in the approval application and shall be inflated to 220 kPa in all cases.

2.2.2.3. The tyre shall be conditioned for a minimum of two hours adjacent to the test track such that it is stabilized at the ambient temperature of the test track area. The tyre(s) shall not be exposed to direct sunshine during conditioning.

2.2.2.4. The static load on the tyre shall be:

- between 381 kg and 572 kg in the case of the SRTT and
- between 60 per cent and 90 per cent of the load value corresponding to the load index of the tyre in any other case.

The variation in load on tyres on the same axle shall be such that the load borne by the more lightly loaded tyre shall not be less than 90 per cent of that of the tyre bearing the greater load.

2.2.2.5. Shortly before testing, the track shall be conditioned by carrying out at least ten braking tests from 90 km/h to 20 km/h on the part of the track to be used for the performance test programme but using tyres not involved in that programme.

2.2.2.6. Immediately prior to testing, the tyre inflation pressure shall be checked and reset, if necessary, to the values given in paragraph 2.2.2.2.

2.2.2.7. Starting from an initial speed of between 87 km/h and 83 km/h, a constant force sufficient to cause operation of the ABS on all wheels of the vehicle and to result in stable deceleration of the vehicle prior to the speed being reduced to 80 km/h, shall be applied to the service brake control and this force shall be maintained until the vehicle has been brought to rest.

The braking test shall be carried out with the clutch of a manual transmission disengaged or with the selector of an automatic transmission in the neutral position.

2.2.2.8. The direction of the test shall be the same for each set of tests and shall be the same for the candidate test tyre as that used for the SRTT with which its performance is to be compared.

2.2.2.9. In the case of new tyres, two test runs shall be carried out to condition the tyres. These tests may be used to check the operation of the recording equipment but the results shall not be taken into account in the performance assessment.

2.2.2.10. For the evaluation of the performance of any tyre compared with that of the SRTT, the braking test shall be carried out from the same point and in the same lane of the test track.

2.2.2.11. The order of testing shall be:

$$R1 - T - R2$$

where:

R1 is the initial test of the SRTT, R2 is the repeat test of the SRTT and T is the test of the candidate tyre to be evaluated.

A maximum of three candidate tyres may be tested before repeating the SRTT test, for example:

$$R1-T1 - T2 - T3 - R2$$

- 2.2.2.12. The mean fully developed deceleration (mfdd) between 80 km/h and 20 km/h shall be calculated for at least three valid results in the case of the SRTT and 6 valid results in the case of the candidate tyres.

The mean fully developed deceleration (mfdd) is given by:

$$\text{mfdd} = 231.48 / S$$

where:

S is the measured stopping distance in metres between 80 km/h and 20 km/h.

For results to be considered to be valid, the coefficient of variation as determined by the standard deviation divided by the average result, expressed as a percentage, shall be within 3 per cent. If this is cannot achieved with the repeat testing of the SRTT, the evaluation of the candidate tyre(s) shall be discarded and the entire order of testing shall be repeated.

The average of the calculated values of mfdd shall be determined for each series of test runs.

- 2.2.2.13. Using the value of the average mfdd for each series of test runs:

In the case of the order of testing R1 – T – R2, the mfdd of the SRTT to be used in the comparison of the performance of the candidate tyre shall be taken to be:

$$(R1 + R2)/2 \text{ where;}$$

R1 is the average mfdd for the first series of test runs of the SRTT and R2 is the average mfdd for the second series of test runs of the SRTT

In the case of the order of testing R1 – T1 – T2 – R2, the mfdd of the SRTT shall be taken to be:

$$2/3 R1 + 1/3 R2 \text{ for comparison with the candidate tyre T1 and}$$

$$1/3 R1 + 2/3 R2 \text{ for comparison with the candidate tyre T2}$$

In the case of the order of testing R1 – T1 – T2 – T3 – R2, the mfdd of the SRTT shall be taken to be:

$3/4 R1 + 1/4 R2$ for comparison with the candidate tyre T1;

$(R1 + R2)/2$ for comparison with the candidate tyre T2 and

$1/4 R1 + 3/4 R2$ for comparison with the candidate tyre T3

2.2.2.14. The wet grip index (G) shall be calculated as:

$$G = \frac{\text{average mfdd of candidate tyre}}{\text{mfdd of SRTT}}$$

2.2.2.15. In the case where the candidate tyres cannot be fitted to the same vehicle as the SRTT, for example, due to tyre size, inability to achieve required loading and so on, comparison shall be made using intermediate tyres, hereinafter referred to as "control tyres", and two different vehicles. One vehicle shall be capable of being fitted with the SRTT and the control tyre and the other vehicle shall be capable of being fitted with the control tyre and the candidate tyre.

2.2.2.15.1. The wet grip index of the control tyre relative to the SRTT (G1) and of the candidate tyre relative to the control tyre (G2) shall be established using the procedure in paragraphs 2.2.2.1 to 2.2.2.15.

The wet grip index of the candidate tyre relative to the SRTT shall be the product of the two resulting wet grip indices, that is $G1 \times G2$.

2.2.2.15.2. The track, and the portion of the track, shall be the same for all of the tests and the ambient conditions shall be comparable, for example, the surface temperature of the wetted track shall be within ± 5 °C. All tests shall be completed within the same day.

2.2.2.15.3. The same set of control tyres shall be used for comparison with the SRTT and with the candidate tyre and shall be fitted in the same wheel positions.

2.2.2.15.4. Control tyres that have been used for testing shall subsequently be stored under the same conditions as required for the SRTT, that is, in accordance with ASTM E 1136 – 93 (re-approved in 1998).

2.2.2.15.5. The SRTT and control tyres shall be discarded if there is irregular wear or damage or when the performance appears to have deteriorated."

Insert a new Annex 5, Appendix 1, to read:

"Annex 5 – Appendix 1

TEST REPORT (Adhesion on wet surface)

Part 1 - Report

1. Type approval authority or Technical Service:
2. Name and address of applicant:
3. Test report No.:
4. Manufacturer and brand name or trade description:
5. Tyre Class (C1, C2 or C3):
6. Category of use:
7. Adhesion coefficient on wet surfaces relative to SRTT according to paragraphs 2.1.2.15. or 2.2.2.15.:
8. Comments (if any):
9. Date:
10. Signature:

Part 2 – Test data

1. Date of test:
2. Test vehicle (make, model, year, modifications, etc. or trailer identification):
.....
3. Location of test track:
- 3.1. Test track characteristics:
- 3.2. Issued by:
- 3.3. Method of certification:
4. Test tyre details:
- 4.1. Tyre size designation and service description:
- 4.2. Tyre brand and trade description:
- 4.3. Reference inflation pressure: kPa
- 4.4. Test data:

Tyre	SRTT	Candidate	Control
Test tyre load (kg)			
Water depth (mm) (from 0.5 to 1.5 mm)			
Wetted track temperature average (°C) (from 5 to 35 °C)			

4.5. Test rim width code:

4.6. Temperature measurement sensor type:

4.7. Identification of the SRTT:

5. Valid test results:

5.1. Wet grip index "G":

5.2. Test results:"
