

## **Proposal for amendments to Part 1 of GTR No. 16**

### **I. Statement of technical rationale and justification**

#### **A. Introduction and procedural background**

1. The objective of this global technical regulation (gtr) is to establish provisions for new radial pneumatic tyres equipping passenger cars and light truck (commercial) vehicles up to and including 4,536 kg (10,000 pounds) under the 1998 Agreement. The official bases of this harmonized set of requirements are Regulations Nos. 30, and 54 and 117 annexed to the 1958 Agreement, as well as the Federal Motor Vehicle Safety Standard (FMVSS) 139 requirements established in the United States of America under the direction of the National Highway Traffic Safety Administration (NHTSA). Regulations from Gulf States Organization (GSO), India and China, although not officially registered in the compendium of regulations for the tyre gtr, were also analysed and requirements from them were considered in this gtr insofar as they were not already covered by one of the regulations from UNECE and United States of America. In addition, parts of FMVSS 109 and 119 were copied directly into this gtr, since they are applicable to certain tyres for light commercial vehicles (LT or C tyres).

2. Many countries throughout the world have already introduced regulations concerning pneumatic tyres. Many of the existing regulations are based on the four primary ones mentioned above. However, many differences in test conditions and regulatory marking requirements require tyre manufacturers to produce almost identical products but with market specific variations to meet local market requirements – including slight variations on sidewall marking provisions.

3. This first phase of the gtr for tyres harmonizes the requirements for passenger car tyres. Work is on-going to define the technical specification for the harmonization of tyres with the designations LT or C which are primarily fitted on light commercial vehicles.

4. Additional technical evaluation is necessary to assess whether consideration should be given for certain tyre types typical in the North American market in relation to the specifications in paragraph 3.12. (referring to the test for adhesion performance on wet surfaces). Government and industry in the United States of America are coordinating to conduct this evaluation.

4-bis. For the purposes of future harmonization, it is noted that amendments are anticipated in the areas of the Strength test for passenger car tyres (section 3.6) and the Tubeless tyre bead unseating resistance test for passenger car tyres (section 3.7). For both tests, work is underway in the United States to modify the test conditions or performance requirements to accommodate certain tyre sizes.

#### **B. Background of tyre regulations**

5. Radial pneumatic tyres for passenger cars and light vehicles are increasingly becoming worldwide products, expected to be used anywhere in the world when mounted as original equipment on new vehicles which are themselves marketed on a global basis. This globalization creates significant opportunities for manufacturers to deliver better and

more cost efficient products but also requires harmonization of the technical provisions at a global level to avoid increasing manufacturing costs.

6. Although testing requirements for different regulations used around the world are often substantially similar, slight variations in test procedures oblige tyre manufacturers to test the same object for the same performance characteristic under slightly different conditions, without any significant improvement in the final product.

7. Marking requirements are also variable around the world, and the same tyre may need several different approval marks to be marketed in a truly worldwide fashion. Any harmonization of such markings should continue to be a priority, as it would clarify the administrative identity of the tyre and facilitate the management of production moulds.

### **C. Procedural background and development of the global technical regulation**

8. This gtr was developed by the GRRF informal working group on the Tyre GTR.

9. The work on this gtr began informally in December of 2004 with a meeting in Paris. As required by the 1998 Agreement, a formal proposal for the establishment of a tyre gtr was proposed to the Executive Committee of the 1998 Agreement (AC.3) by the technical sponsor, France. At the 140<sup>th</sup> session of the World Forum for Harmonization of Vehicle Regulations (WP.29) on 14 November 2006, the French proposal was approved as a gtr project by AC.3 (ECE/TRANS/WP.29/2006/139). The adopted proposal was published as ECE/TRANS/WP.29/AC.3/15.

10. Subsequent to that approval, the informal working group on Tyre GTR met on numerous occasions. In addition to three unofficial meetings held between December 2004 and November 2006, another ten meetings were scheduled in conjunction with GRRF sessions and a further two interim meetings were held in Brussels in July 2007 and July 2009.

11. In 2009, at the request of the informal working group, AC.3 approved the development of the gtr in two phases: the initial phase being dedicated to harmonizing requirements for passenger car tyres only, and requirements for light truck tyres, which carry a C or LT designation, to be harmonized as a second phase. In the interim, the existing requirements for C or LT tyres (albeit non-harmonized) are included in the first stage of the gtr for completeness. The current document reflects that decision and contains only harmonized requirements for passenger car tyres, with the LT/C requirements remaining to be harmonized.

12. Tests or requirements for radial passenger car tyres required extensive harmonization during the course of the informal working group's mandate. These newly harmonized tests or requirements are:

- (a) High speed test;
- (b) Physical dimensions test;
- (c) Required markings.

13. Several other test requirements for radial passenger car tyres existed only in one of the existing regulations and needed no harmonization. These tests were simply included as direct copies in the gtr for tyres. In particular, no harmonization was required for:

- (a) Endurance test;
- (b) Low pressure endurance test;

- (c) Bead unseating test;
- (d) Strength test;
- (e) Rolling sound emission test;
- (f) Wet grip test;
- (g) Run flat test.

14. Harmonizing the high speed test posed a significant challenge in that the two existing tests were quite different from each other and based on different principles. One was designed to ensure that a tyre would perform adequately at speeds well above a national speed limit, but the test requirements were not related to any speed symbol indicated on the tyre itself. The other required that a tyre pass a test at its highest rated speed.

15. Taking into account the long experience of FMVSS standards in the United States of America and in countries applying Regulation No. 30, and the huge amount of test results corresponding to these two testing procedures, it was decided to base harmonization on a combination of the two existing test procedures rather than develop a wholly new harmonized test procedure. The harmonization work was based on a determination of which test was more onerous for tyres of different speed symbols, and using the best test procedure.

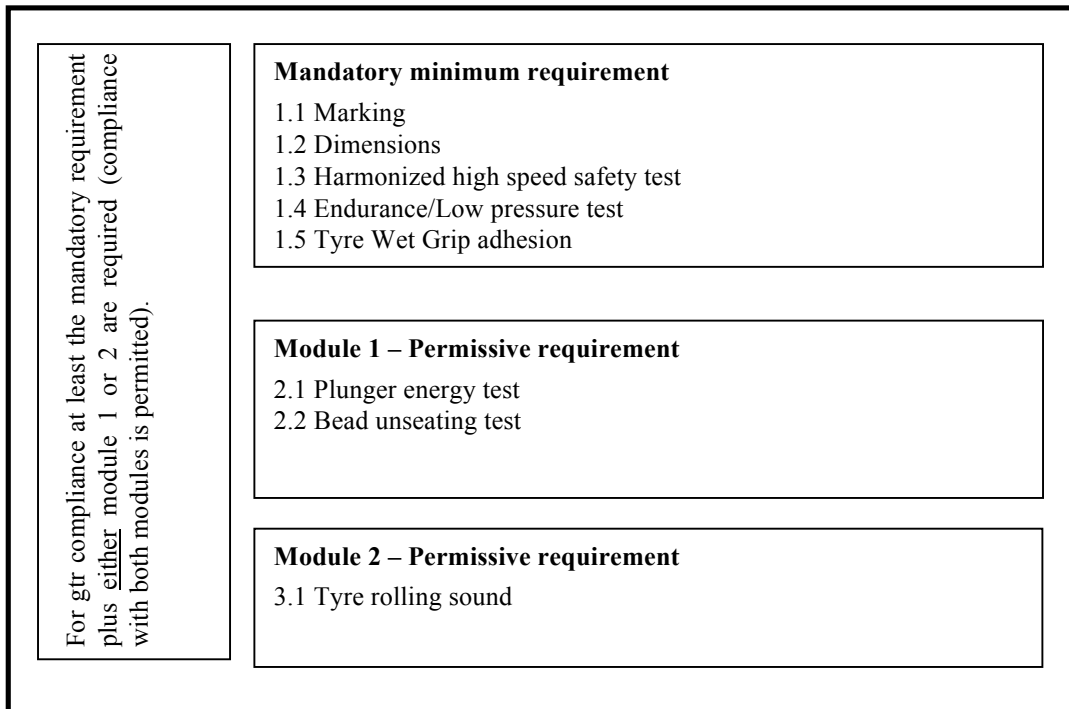
16. At the meeting of the ad hoc working group in September 2006, three different scenarios for the high speed test harmonization were discussed. One of the options considered was to use the FMVSS 139 high speed test for tyres with a speed rating equivalent to the symbol of "S" and below (less than or equal to 180 km/h), and the Regulation No. 30 test for speed symbols above "S" (greater than 180 km/h). At that meeting, there was a general consensus by the Contracting Parties that this proposal could be considered as a starting point, but it would require significant further work in order to demonstrate the validity of the proposal.

17. The tyre industry presented a theoretical method to determine, for each speed symbol, the test which is the most severe and to validate that the equivalence point (the speed symbol for which both tests are equally severe) between the two tests is reached at a specific speed symbol. Over the following year the tyre industry gathered data to demonstrate this concept. Six tyre manufacturers supplied data, and in total, 704 tyres were tested using both tests. All the tyres were tested above and beyond the normal high speed test requirements, and the number of steps that each tyre was able to withstand above the regulatory limit, were counted. The ratio of the number of Steps above the Limit (SAL) for the FMVSS 139 test, divided by the number of steps above the limit for Regulation No. 30 test was used to evaluate the data. Based on this extensive set of data, it was determined that the FMVSS 139 high speed test was more severe for tyres with speed symbol of S and below (less than or equal to 180 km/h). The Regulation No. 30 high speed test was more severe for tyres with speed symbols of T (190 km/h) and above.

18. To validate this concept further, work was undertaken on a smaller sample of tyres to determine the temperature increase during the different tests. In all cases, it was demonstrated that for T rated tyres and above, greater energy input was required (as determined by the increase in the contained air temperature) during the Regulation No. 30 test than from the FMVSS 139 test. This data was also independently confirmed by one of the Contracting Parties. Since the increase in temperature of a tyre should be directly related to the amount of energy supplied during the test, a higher internal tyre temperature at the end of a test indicates a higher degree of severity. At the meeting in September 2008, it was agreed to use the Regulation No. 30 test for tyres with speed symbols of T (190 km/h) and above, and to use the FMVSS 139 high speed test for all lower speed symbols (180 km/h and below).

19. The physical dimensions test was less difficult to harmonize from a technical point of view, because of the elementary simplicity of determining the outside diameter and width of a tyre in its inflated state to ensure interchangeability between tyres marked with the same size designation. A small but not insignificant gain has been achieved by harmonizing the measuring of the tyre's width at four points around the circumference.

20. After the inventory of different tests for passenger car tyres existing in the world had been made, it appeared that some of these tests might be harmonized on a worldwide level, while some of them appeared to have a more regional application. In order to take this situation into account, the technical sponsor of the tyre gtr proposed to organize the different tests into three modules:



21. This modular structure was described in document ECE/TRANS/WP.29/AC.3/15 that was adopted by AC.3 as the formal request of authorisation to develop the gtr.

22. The informal working group developing the gtr pursued the modular approach. As the group continued to develop the modular approach a wider appreciation among Contracting Parties of the application of modules emerged. This prompted proposals for a less prescriptive approach to some of the individual elements included in the mandatory module. The informal group considered alternatives to deliver the requirements of Contracting Parties while retaining the original modular approach but could not find a sufficiently robust solution. As a result the group proposes a revised structure centred upon a "General Module" plus two options (Options 1 and 2). These are described in the table.

<i>Passenger car tyres</i>		
	<i>Test name</i>	<i>Paragraph(s)</i>
General module	Marking and tread wear indicators	3.2., 3.3. and 3.4.
	Physical dimensions	3.5.
	High speed test	3.11.
	Endurance test	3.9.
	Low pressure test	3.10.
	Wet grip test	3.12.
	Run flat test	3.13.
Option 1	Strength test	3.6.
	Bead unseating test	3.7.
Option 2	Rolling sound emissions	3.8.

23. In this initial version of the gtr for tyres, the harmonized requirements apply only to tyres for passenger cars. The module concept does not apply to LT/C tyres and the following table describes the tests applicable to these tyres.

<i>LT/C tyres</i>	<i>C type tyres</i>	<i>LT type tyres</i>
<i>Test name</i>	<i>Paragraphs related to Regulation No. 54</i>	<i>Paragraphs related to FMVSS 139</i>
Marking and tread wear indicators	3.2., 3.3. and 3.4.	3.2., 3.3. and 3.4.
Physical dimensions	3.21.	3.20.
High speed test	3.16.	3.19.
Endurance test	3.16.	3.17.
Low pressure test	None	3.18.
Wet grip test	None	None
Run flat test	None	None
Strength test	None	3.14.
Bead unseating test	None	3.15.
Rolling sound emissions	3.8.	None

23-bis. However, since the gtr contains only technical prescriptions and no legal aspects concerning implementation of this gtr in national/regional legislation of the Contracting Parties to the 1998 Agreement, irrespectively to the above described module concept, only a Contracting Party decides on the way of transposition of the gtr provisions into its national/regional legislation. In order to facilitate the transposition process it may be recommended to apply a stepwise approach and for the first stage to select just those provisions and test methods of the gtr, which mostly suit the regulatory needs of a Contracting Party. Meanwhile, it is anticipated that a Contracting Party will allow an access

to its internal market the tyres complying with the provisions of the gtr, which that Contracting Party does not apply for that moment, bearing in mind that such tyres are in compliance with national/regional legislation of that Contracting Party.

24. In the case of required markings, it was possible to eliminate some that had become unnecessary over the years, such as the words Radial and Tubeless. Indeed over 90 per cent of passenger car tyres and LT/C tyres sold worldwide are radial and tubeless construction and so continuing to mark tyres is unnecessary. In addition, a change was made in the way the Tyre Identification Number (TIN) will be used in combination with other markings.

25. The TIN format is based on NHTSA's plan to change the currently assigned 2 digit plant codes to 3 digits. A symbol, the number "1" for example, will be reserved to precede all current 2-digit codes, and be used exclusively for existing plant codes. The "1" would only be used as the prefix for existing 2-digit codes, and not be used as the leading digit for any new 3-digit codes. NHTSA will continue to assign global plant codes and the necessary information to obtain such a code is contained within the gtr.

26. The aim of the tyre gtr is to introduce the universal worldwide harmonized requirements to tyres included into the scope of the gtr. In accordance with the provisions of the 1998 Agreement, once the gtr is adopted, those Contracting Parties voting in favour of its adoption will start the process of transposing those requirements into their national legislation. In the interests of moving rapidly towards creating a "global tyre" approach the informal group suggests that Contracting Parties transpose the gtr requirements in a flexible way to permit tyres complying with the full requirements access to as many markets as possible.

27. Consideration was given to harmonize the approval markings (both type approval and self-certification markings) and discussions on this issue were elevated to WP.29 and AC.3 meetings. It was concluded as not possible currently to adopt a harmonized approval marking since the compliance assessment procedures are not yet harmonized worldwide. So this gtr contains no administrative provisions on approval markings. In the absence of a harmonized marking, the Contracting Parties retain the option to assign markings to tyres, especially markings for a "global tyre", and these can be introduced within their national / regional compliance assessment systems.

28. It is anticipated that the Contracting Parties will incorporate the provisions of the gtr into regulations within their legal framework. This may include applying suitable tyre marking and so help provide for market recognition between the Contracting Parties of tyres complying with the provisions of this gtr. Such an approach might encourage wider recognition of harmonized markings and thus further the move towards a single global marking where tyres meet the full requirements established by this gtr.

28-bis. In parallel to development of this gtr, UN Regulation No. 117, which is a base for this gtr, had been amended several times by detailing and extending the provisions to tyre wet grip performance, adding the provisions for rolling resistance and for classification as snow tyre for use in severe snow conditions for all tyre classes included in its scope. As harmonization of the newly introduced provisions of UN Regulation No. 117 was not feasible in a reasonable time frame, the decision for this gtr was not to consider those provisions for inclusion in the text of the gtr at that time. Those new provisions represent the state-of-the art level and are important for assessment of performance of tyres on the markets worldwide. Therefore at so-called "Phase 1b" the relevant provisions aligned with those of UN Regulation No. 117 are introduced by the Amendment No. 1 to this gtr.

28-ter. The Amendment No. 1 to this gtr incorporates:

- (a) Amendment of Part I by adding new paragraphs 4-bis, 23-bis, 28-bis and 28-ter;
- (b) Amendment of Part II:

- (i) Addition of new definitions (Section 2);
  - (ii) Modification of test for adhesion performance on wet surfaces (Section 3.12);
  - (iii) Addition of new requirements to rolling resistance (new Section 3.22);
  - (iv) Addition of new requirements for qualification of a tyre to be designated for use in severe snow conditions (new Section 3.23);
- (c) Addition of new Annexes containing the details of the newly added test methods.

#### **D. Technical and economic feasibility**

29. The tyre gtr has been developed by drawing on the experience of many stakeholders, including regulatory authorities, type approval authorities, tyre and vehicle manufacturers and technical consultants. The gtr has been built upon the experience of many organizations and individuals with expertise in the area of tyres for passenger cars and light trucks or light commercial vehicles.

30. The tyre gtr has been designed to update and improve upon existing regulations, and the requirements are based on existing concepts in different Contracting Parties' present regulations.

31. Since this gtr is based on existing requirements and some harmonized tests, no economic or technical feasibility study was deemed necessary. When transposing this gtr into national legislation, Contracting Parties are invited to consider the economic feasibility of the gtr in the context of their country.

#### **E. Anticipated benefits**

32. The principal economic benefit of this regulation will be a reduction in the variety of tests for the same or substantially similar requirements.

33. Depending on how different Contracting Parties implement this gtr, there may be benefits due to the way the approval markings are treated. Tyre mould design and fabrication might be rationalized, with associated reductions in production costs.

34. Safety benefits resulting from the transposition of the gtr in the national legislations depend on the previous level of the national regulations.

#### **F. Potential cost effectiveness**

35. It is not possible to assess, at this moment, the total costs linked to the gtr. On one hand, there are more tests in the gtr than in the existing national or international regulations; on the other hand the harmonization of the regulation will reduce the global cost of type approval in the variety of countries which will apply the gtr through that administration procedure.

36. Safety benefits are anticipated, but it is not yet possible to assess them in terms of reduction of number of accidents and victims.