

# TYRE/ROAD NOISE REFERENCE BOOK

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Several major policy documents from international organisations or expert groups have identified tyre/road noise as the component of road transportation noise which is the most urgently in need of being reduced. Road traffic noise from a fleet of modern vehicles is generally dominated by noise from tyre/road interaction. In 2001, the EU introduced noise emission limits for tyres and preparations are currently being made within the UN/ECE to introduce a tyre noise emission regulation. International standards on tyre/road noise issues are underway. The industry itself now often identifies tyre/road noise as a major future problem to which substantial resources must be allocated. Road and environmental authorities face tyre/road noise as the major road traffic noise component in most situations when noise reduction is needed. A high competence in this subject is necessary in order to meet future demands from society and customers.

To provide a timely and up-to-date aid in reaching such high competence, as well as providing a general but comprehensive overview for the interested environmental expert, we are proud to announce the availability of the

## **TYRE/ROAD NOISE REFERENCE BOOK**

- Authors:** **Adj. Prof. Ulf Sandberg**, Swedish National Road and Transport Research Institute (VTI) and Chalmers University of Technology, Sweden  
**Prof. Jerzy A. Ejsmont**, Technical University of Gdańsk (TUG), Poland  
Both authors are well known and experienced in the subject. Prof. Sandberg has been involved in tyre/road noise research and abatement since 1974 and Prof. Ejsmont has been active with the same since 1978. Both have written doctoral theses on the subject.
- Publisher:** INFORMEX, SE-59040 Kisa, Sweden
- Extent of book:** 640 pages, 800 illustrations and tables (almost all are in colour).  
Format: 270x200 mm (about 40 mm thick). Weight: 2.5 kg. Hard cover.
- Target audience:** Everybody working with or interested in road transportation noise.  
(Readers who lack a basic knowledge of acoustics may appreciate the special chapter that gives an introduction to the subject of sound and noise).
- Purpose:** The purpose with the book is to give a comprehensive and up-to-date state-of-the-art review. It is also intended to be useful as a handbook on the subject.
- Contents:** Terminology - Brief facts about sound and noise - Historical perspectives - Tyre/road noise as part of vehicle noise - Aspects of human perception related to tyre/road noise - Basic information about tyres and road surfaces - Noise sources and generation mechanisms - Source locations - Models - Tyre/road noise: general influences and typical data - Driver influence - Influence of various tyre-related parameters - Road surface influence - Influence of environmental parameters - Influence of vehicle construction - Standards and measuring methods - Basic measures - Factors affecting measurements - Reference tyres and reference surfaces - Measuring instruments and equipment - Compromise between noise and other parameters? - Tyre/road noise in traffic noise prediction models (road surface corrections, etc) - Noise reduction measures related to tyres - Design of low noise road surfaces - Low noise road surfaces (state-of-the-art) - Futuristic tyre and road surface designs - The EU Directive and possible other regulations - Noise labelling - Costs and benefits - Literature search - References - Index
- Price:** EUR 190 (or USD 190 or SEK 1700), incl. postage. See the next page for order form.

### **What a renowned road and tyre expert says about the book**

"This book is a very valuable reference work, arising from the expertise and experience of the authors. Their links with research oriented organisations have enabled them to access the work from the distant past to the present, of tyre, vehicle and road laboratories round the world. They have clearly distinguished between the referenced works and their opinions on them. Through a connection with International Standards Committees, they have been able to learn of both existing and forthcoming legislation. The complexity of the tyre noise excited by the interaction of the tread pattern with road surface texture has been well covered and consequently this reference book deserves to be on the bookshelf of all those continuing to lead this subject forward."

**Dr John C. Walker**  
**PhD. CPhys. MinstP.**

*Dr Walker's working life was in the Tyre Industry, starting on the subject of Tyre/Road Noise in 1948, in Dunlop Research Centre in Birmingham, UK. Although studying other tyre physical phenomena, he retained a strong interest in noise and through work on this he was awarded a PhD in 1981 from Aston University, with the thesis on "Noise Generated at the Tyre/Road Interface". He continued further Tyre/Noise research until he retired in 1991 as a Principal Physicist. He was an expert on Tyre/Road noise and has given many papers on the subject with equal emphasis on Tyre and Road Surfaces. Contact details are:*

*E-mail: johnwalker29@hotmail.com*

## What a renowned road and tyre expert says about the book

"I have had the opportunity of becoming intimately familiar with this book prior to its publication when I reviewed and proof read the draft manuscript. My overall impressions are that the book is both comprehensive and extremely detailed. It covers all the issues that I would have expected to find in such a book that deals with what is a substantial and complex topic. Furthermore it addresses both tyre and road aspects of the subject so that it will be appealing to those in the tyre as well as the road industries.

Throughout the book the technical content is of a very high standard indeed. The authors have made it clear where they have made their own comments and opinions and where the sources of the technical content were taken. It is apparent that the explanations and discussions throughout reflect the extensive experience and expertise of both authors.

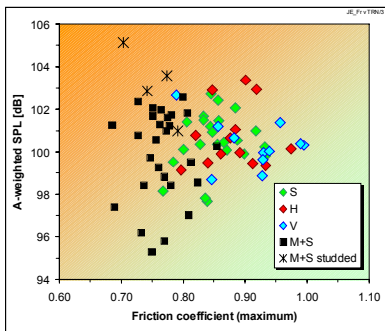
There is no doubt in my mind that the book brings together a wealth of information of which much has hitherto been available in a range of most diverse sources. As such it makes a substantial contribution to existing technology and sets some courses for the future. It is a most useful book.

The book fills a type of void in knowledge about tyre/road noise and I think many who read it will wonder why such a book has not been available until now."

**Dr Stephen E Samuels**  
PhD, M Eng Sci, BE, FIEAust, MAAS, MASA

Sample page from the book (original size is 270x200 mm):

These friction coefficient averages are summarised in Table 18.1 and Fig. 18.4 together with noise level averages. The average noise levels for tyres in the groups "S", "H", and "V" are very similar but at the same time average friction coefficients (especially maximum values) are higher for tyres with higher speed ratings. This indicates that tyres for high speed provide better friction and braking forces without a significant penalty in noise. Winter tyres, however, are less noisy than summer tyres but at the same time their friction coefficients are also lower. It can probably be explained by the use of rubber compounds optimised for low temperature conditions.

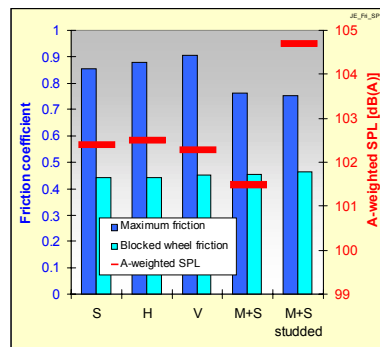


**Fig. 18.3** Tyre/road noise level tested with the CPX method at 90 km/h on the DAC 16 mm surface for different tyre types plotted against the maximum friction coefficient. "S" - summer tyres for speeds up to 190 km/h, "H" - summer tyres for speeds 210 km/h, "V" - summer tyres for speeds over 210 km/h, "M+S" - winter tyres, "M+S studded" - winter tyres with studs.

**Table 18.1** Average friction coefficients and A-weighted SPL's for different groups of tyre.

Tyre type	A-weighted SPL [dB]	Friction coefficient	
		Max.	Block
S	102.4	0.853	0.441
H	102.5	0.881	0.442
V	102.3	0.905	0.451
M+S	101.5	0.763	0.454
M+S studded	104.7	0.753	0.464

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**Fig. 18.4** Average friction coefficients and A-weighted SPL's for different groups of tyres.

Based on the presented results it was concluded that no conflict could be detected between low noise on dry surfaces and high friction on a wet road surface.

### 18.2.4 The TÜV/UBA Experiments in Germany

A recent and quite comprehensive study was conducted in Germany by TÜV on behalf of Federal Environmental Protection Agency (Umweltbundesamt). The study was based on noise measurements with the coast-by method on a dry road surface and friction measurements on a wet road surface conducted to determine braking distance as well as aquaplaning speed. The latter is especially interesting since it has been claimed by some that the "open" tread patterns needed to obtain high aquaplaning speeds will also cause high noise levels. Measurements were only made on one surface (an ISO surface) and a total of 48 car tyres was tested [Stenschke & Vietzke, 2000].

The results showed that there was no correlation between noise and "wet braking", nor between noise and aquaplaning speed. The relation between wet braking distance and noise level for all 48 tyres is shown in Fig. 18.5 Corresponding data for the speed at which aquaplaning starts is shown in Fig. 18.6 Although there are weak trends, the correlations are not statistically significant at the 5 % level. A similar study was made for heavy vehicle tyres; although aquaplaning was not tested here since it is not an important issue for truck tyres. A total of 32 tyre types for use on heavy vehicles was included in the study. The results were presented for each group of tyres (of various sizes) separately, and Fig. 18.7 shows the results for the group containing the heaviest tyres. Similar

Initially working in the Australian Tyre Industry, Dr Samuels was seconded to Monash University in Melbourne where he gained a M Eng Sci degree for research on tyre noise generation. From there he spent 15 years undertaking re-search mainly on tyre, road and traffic noise issues at the Australian Road Research Board. In 1988, he gained a PhD for work on traffic noise prediction modelling from the University of Newcastle in Australia.

For a period Dr Samuels served as Head of Transport Engineering and Senior Lecturer at the School of Civil and Environmental Engineering, University of New South Wales. He still holds a position there as a Visiting Research Fellow.

Dr Samuels has also worked for some time in the acoustic and environmental consultancy industry and is now a Director of TEF Consulting (Traffic, Environmental and Forensic Engineers) located in Sydney, New South Wales, Australia. Dr Samuels has gained a life-long specialist experience focused on noise and other characteristics of road surfaces but has also worked with tyre and vehicle issues. His publications in this area are numerous. Dr Samuels' contact details are as follows.

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