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Book Review

Building Acoustics, Tor Erik Vigran, Taylor & Francis (London and New York) (2008), ISBN: 9780415428538

Considering the number of people that are affected by sound and vibration inside buildings, the topic of building acoustics is arguably one of the more important ones in engineering acoustics. Whilst there are in-depth technical books concerned with specific aspects such as room acoustics, structure-borne sound, sound insulation, absorption, and diffusion, this book covers a range of subjects starting from the fundamentals of sound and vibration leading to room acoustics, sound absorption, and sound transmission in buildings.

The author, Tor Erik Vigran, has a wealth of experience originating from his teaching and research at the Norwegian Institute of Technology and the Norwegian University of Science and Technology. This book was originally a Norwegian language edition published by the author in 2002 that has been translated into English with updates and additions to the text, particularly on the topic of sound absorption. The translation is very good, and the reader will generally be unaware of this fact except for the occasional sentence that uses a slightly odd phrase, incorrect spelling or terminology. The writing style is accessible, the layout of the book is uncluttered, the graphics are clear, and the author has been careful in ensuring that the nomenclature conforms to International Standards. The lists of references at the end of each chapter are sometimes quite short but this is mainly due to the fact that other monographs are being referenced.

The intended readership for the book is students undertaking advanced level engineering studies in acoustics, practitioners, and acoustic consultants engaged in problem solving in buildings. It is notable that the chapter titles reflect these two different audiences and they give an indication of how the book might be used.

Chapters 1–3 are clearly aimed at the aforementioned students and have generic titles that describe the fundamental physical phenomena, namely ‘Oscillating systems: description and analysis’, ‘Excitation and response of dynamic systems’, and ‘Waves in fluid and solid media’. These chapters presuppose that the reader is already comfortable with basic concepts of waves and signal processing. In fact, the text would be quite well-suited to those with a background in electrical engineering, mechanical engineering or physics who are moving into the field of acoustics, and in particular the field of building acoustics. Unlike other study books in acoustics, there are no sets of questions at the end of these chapters; although the reader is occasionally invited to consider a related problem, derive other equations, or answer a question that is posed within the main text. Whilst the core material can generally be found in other textbooks, the author has taken care to highlight its relevance to areas of building acoustics. Hence the practitioner who starts at the beginning of the book and works forward will generally be rewarded with a greater understanding and insight into the simplifying assumptions that commonly need to be made in problem solving.

Chapters 4–9 have titles that are likely to attract the attention of practitioners, such as ‘Room acoustics’, ‘Sound absorbers’, and ‘Sound transmission in buildings: Flanking sound transmission’. Within these chapters there are also many sections covering the underlying theory with derivations and reviews of different theoretical models that would be suited to advanced level engineering studies. A balance is maintained between the provision of sufficient theory to ensure a thorough understanding, while giving practical engineering guidance for problem solving. The chapter on room acoustics covers the fundamental theory for sound pressure and reverberation times in enclosed volumes as well as an introduction to scattering and the main features of ray tracing and image-source models. This provides practitioners with the necessary background to solve acoustic problems in both small and large rooms (assuming that they have access to commercial software for the large room models). Concerning the prediction of sound absorption for porous materials, the author presents practical models that are based on an equivalent fluid. Many of these models require parameters that are generally unavailable to the consultant and require decisions as to whether the material can be modelled as having a rigid or elastic frame; hence they would also be of practical use to technically proficient manufacturers. Concerning sound insulation, the author introduces analytical and statistical models for sound transmission through single and multi-layer wall/floor elements as well as elements such as apertures, ducts and suspended ceilings. For cavity wall constructions a number of different sound transmission models are presented to the reader. This is entirely reasonable because there is no single theory that adequately covers all possible constructions and each model can provide useful insight into the transmission process. However, in the final chapter on flanking transmission it is noticeable that the prediction model used in the Standard EN 12354 is referred to as a ‘complete model’ for predicting sound insulation between two rooms. By this stage of

the book, the reader has already been introduced to statistical energy analysis in a short chapter. For this reason it would have been useful to have discussed and illustrated the limitations and potential errors that can occur when using EN 12354, particularly when compared against the full matrix solution with statistical energy analysis.

In summary, this book fulfils its aim of providing physical insight into the underlying theories of sound and vibration that are relevant to building acoustics, with many practical applications relating to measurement and prediction in the laboratory and the field. For this reason it is recommended to both students and practitioners that are primarily interested in room acoustics and sound transmission in buildings.

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¹ Author of the book "Sound Insulation" (Butterworth-Heinemann, 2007).
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