Sound insulation in buildings, Jens Holger Rindel, CRC Press, Taylor and Francis Group, 2018.

This book represents combined theoretical and practical approaches to the sound insulation problems in acoustics. Some important historical aspects and development of measurement procedures for sound insulation and room acoustics parameters in the beginning of 20th century were mentioned and explained in introduction. All relevant scientists, who were doing the research in this interesting field, are mentioned in introduction.

The basic concepts of acoustics regarding the level scale and frequency range are explained with simplified mathematical expressions, however with enough complexity for explanation of the most relevant parameters which occur in praxis i.e. critical frequencies, longitudinal waves in air, shear and bending waves in plates. Some review of fundamental mathematics used later in the book is given in the first chapter.

In Chapter 2, the equation of harmonic oscillator as a basis for all consideration in acoustics is explained in a very simple and understandable way and in addition, it is connected with practical problems. Practical examples such as design of vibration insulators for excitation frequency are explained by using basic theoretical considerations and mathematics described in the first chapter.

In Chapter 3, the effects of reflections from walls at normal, oblique and random incidence angles assuming diffuse field in the room are explained with the purpose to see the influence of reflection coefficients on all parameters of acoustic field (pressure, particle velocity, energy densities). The parameters of sound field in the room under the influence of reflections from the walls are connected with room acoustic parameters and sound insulation parameters of building elements.

Introduction to room acoustics is the title of Chapter 4, however the authors give much more information than just introduction. This chapter explains the standing wave in a rectangular room, modal reverberation times and transfer function in a room. Theoretical considerations are connected with practical examples where overlapping of the modes and determination of each mode parameters (bandwidth, losses) can be found from measurements of impulse responses in frequency domain. The path via higher frequencies where statistical room acoustic principles are explained with basic acoustic field parameters in diffuse field, energy balance in a room and reverberation time formulas are included in this chapter. The measurement technique for determination of reverberation time is also covered in this chapter.

In Chapter 5 first, short theoretical definition of sound insulation parameters (sound transmission index and apparent sound reduction index) are described from basic theory and measurements. The theoretical equations for multi-element partitions and apertures, single and double leaf constructions are given with all relevant phenomena described i.e. mass law, critical resonances together with measurement examples.

The impact sound insulation parameters are also explained describing measurement procedures and equations from relevant standards. The single number rating of sound insulation parameters is described by using practical measurement examples. The influence of reference curves and spectral adaptation terms on sound insulation parameters is explained very clearly. Requirements for airborne and impact sound insulation parameters in different countries worldwide are given in Table 5.2.

Chapter 6 deals with sound radiation from plates covering bending and shear waves and sound radiation from propagating transverse waves in plates with radiation efficiency. Sound radiation is explained for freely and forced vibrations in rectangular plates.

In Chapter 7 the principles of statistical energy analysis of rooms and plates is covered with description of the forced and resonant transmissions through different structures (e.g. single wall as vibrating plate).

Chapter 8 covers the airborne transmissions through single constructions and sandwich plates in a more detailed way than Chapter 5. It introduces the wall impedance with equivalent electromechanical circuit. Resonant transmission is also explained together with transmission through thick plates.

Chapter 9 describes the airborne transmission through double constructions, sound bridges, drywalls, windows.

In Chapter 10 a more detailed derivations of impact sound insulation parameters assuming pulse force excitation are described. The point excitation of a plate with impact sound pressure level radiated from massive floors is explained with influence of resilient floor coverings and floating floors on the impact and airborne sound insulation parameters. Dynamic stiffness of loaded mineral wool, resonantly and locally reacting floors, point supported floors is described together with suspended ceilings. Massive wood floor constructions are covered in detail and they are supplemented with measurement examples. From practical point of view the typical complaints about impact sound insulation are explained regarding the lower frequencies.

In Chapter 11, the author explains the flanking transmission of airborne and impact sound considering the connections between mean sound pressure in source room and mean velocity of forced vibrations in excited plates. The junction attenuation and influence on the sound insulation parameters is described very thoroughly together with all parameters which have influence on the results.

Chapter 12 covers the measurements methods for determination of airborne and impact sound insulation parameters regarding measurement instruments, measurement positions for all types of structures (walls, windows, facades, floors) and for all parameters. Special emphasis is given on the low frequency procedure where the problems in real case scenarios appear. In addition, vibration measurements are covered with calibration of instruments, structural reverberation times and loss factors.

A more detailed explanation of measurement procedures for measurement uncertainty is covered in Chapter 13 with basic statistical concepts applied to pressure distributions in rooms at low and high frequencies regarding different zones in room (close to the boundaries), the influence of measurement time and signal types. The different averaging principles are described and connected with all input parameters (sound pressure levels variance, reverberation time variation) needed for calculation of sound insulation parameters in one third octave bands and single number values.

The sound insulation from users' point of view is analysed in Chapter 14 with all relevant parameters mentioned such as noise descriptors, dose effects etc. Different types of environmental noise sources like traffic are analysed bearing in mind their annoyance to the people. The sound insulation parameters are connected with subjective annoyance of people exposed to the different types of noise sources. Design criteria for a satisfactory sound insulation are proposed in this chapter.

Some interesting examples of buildings with large sound insulation parameters are shown in Chapter 15 with described purpose of experiments with them and building concepts. The project requirements and measurement results for sound insulation parameters are shown for a Quiet house in Lund, Sweden, an Open house urban building System in Denmark, the brf Kajplasten in Stockholm, Sweden, an Echo house in Denmark and Ylojarvi apartments in Finland.

It can be notices from the book, that author J. H Rindel has a rich and combined practical and theoretical experience for writing such an interesting book. The interested reader can find everything relevant for topics described in each chapter of the book. In general the book aims to encourage students and experienced acoustic engineers to try tackling practical problems in this field.

It was a very interesting journey reading such an amazing book.

Antonio Petošić