

Book review

Construction Vibrations by Charles H. Dowding, Prentice-Science & Math, New Jersey, 1996, 610 pp.

This second book on vibrations written by this well-known professor of Civil Engineering at Northwestern University, expands upon his first book, *Blast Vibration Monitoring Control* (1985) to include ground-borne vibrations caused by construction activities, including blasting. Attractive in design and layout, the book uses a slightly smaller font and denser text than usual to pack a remarkable volume of valuable information into its 600 pages.

The primary focus of the book is on ground vibration sources and their effects on structures, and on vibration monitoring and measurement. Comparatively little space has been given to blast design and control of construction vibrations. The topics are generally presented in survey form, in short stand-alone chapters that provide a concise and readily understandable treatment. Ideally suited for the professional wishing to learn the subject through self-study, *Construction Vibrations* should be of interest to civil, mechanical and mining engineers, as well as contractors, regulators, geophysicists and geologists.

Following a general-to-specific paradigm, the book is divided into three distinct sections: basic technical concepts, experimental observations specific to each source of construction vibration, and blast design and control. Each of the thirty-one chapters begins with a logical introduction, develops the topic, and ends nicely with a concluding summary. Each chapter includes a selection of homework problems, and a valuable appendix contains answers with thorough explanations. Nearly 300 references are cited throughout the text and are tabulated alphabetically at the end of the book. Although many of these references cover the 1970–1985 time frame, more recent works are cited. Some of the references appear to have come from the author's experience as a consultant, and may prove difficult to obtain even for the most diligent reader.

Topics presented in the first section of *Construction Vibrations* include fundamental physics of ground motions, techniques for predicting peak particle velocities, ground wave attenuation using both square-

root and cube-root scaling, and an explanation of the response spectrum. Six chapters of the first section cover cracking of cosmetic finishes in residential structures. The author demonstrates an impressive knowledge of this subject area, and has done a commendable job of synthesizing and summarizing the decades of research on this important practical problem. Results of full-scale case studies of residential vibration response to blasting are concisely reported, meaningfully compared, and supplemented with values of failure strains in typical residential building materials ranging from gypsum wallboard to masonry walls.

Topics in the second section include noise generation during construction operations, pile driving, impacting and rotating construction equipment, structural demolition through explosive charges, and stability of rock slopes. Other chapters deal with response of rock and buried structures. Three chapters present surveys of human perception of continuous and transient vibrations, microvibration and sensitive equipment, and vibration measurement and instrumentation. Because the latter three chapters are surveys and do not penetrate the subject to great depth, the reader is likely to have more thorough resources at hand.

Specifications for control of construction vibrations, explosive products, and blast design comprise the final section. Chapter 31 concludes the book with a description of the computer program NUVIB, which is available free of charge by contacting the author. Of interest to some will be the extensive appendix "Specifications for Controlled Blasting, Close-In Blasting, Densification of Sand, and Demolition."

The charts, graphs, and tables used liberally throughout the book are well thought out and easy to follow. In many cases, values are specified in both imperial and SI units, even on the graphs. Although the chapters on specific construction vibration sources might be used effectively as a reference guide to be consulted routinely, it is the reviewer's perspective that in some places the organization of topics could be improved. For instance, Chapters 10 and 11 on frequency-based control and prediction of principal frequencies might be placed in the introductory chapters so that discussion of cosmetic cracking is uninterrupted.

Construction Vibrations is an outstanding book on the topics of construction and blast-induced vibrations. The practicing engineer will be pleased with the

breadth of coverage provided, finding the realistic and practical examples extremely valuable.

Christopher V. White
Exponent Failure Analysis Associates
Menlo Park, CA, USA



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