Blast Vibration Analysis

By Professor G. A. Bollinger

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An aid to those who make and **interpret blast vibration measurements, this book serves as an especially useful and timely introduction**

Wave phenomena are a familiar part of everyone’s experience. Water waves are perhaps the most graphic, but the existence of sound waves, light waves, and electromagnetic radio and television waves is also well known. The destructive effect of earthquake waves receives widespread publicity. It is thus obvious that gases, liquids, and solids will support wave motion. For the understanding and analysis of blast vibrations, scientists and engineers require a sophisticated understanding of wave phenomena. G. A. Bollinger in *Blast Vibration Analysis* makes an important contribution to this study focusing on the origin, transmission, and types of elastic wave in solid media. The physical laws involved in waves analysis as well as the mathematical tools needed to specify and analyze the variety of wave phenomena encountered in nature are also provided.

Mr. Bollinger synthesizes the theory and literature from the seismological, geophysical, and engineering disciplines pertinent to the subject area of blast vibrations induced by quarrying, mining, and engineering operations. While the theory and analytical techniques presented do apply to vibrations from earthquakes and nuclear explosions, the author avoids developing a specific consideration of those latter phenomena. However, he applies the analytical tools that have been so highly refined in earthquake engineering, earthquake seismology, and seismic exploration for petroleum, i.e., digital and spectral analyses, to the blast vibration problem.

Dividing his book into five textual chapters, Mr. Bollinger devotes the first two to a detailed consideration of seismic waves, both from a general physical viewpoint as well as from the effects of blasting. The third chapter covers the mathematical theory of the seismograph along with examples of instruments currently used by professionals. A very specific discussion of the analysis of blast vibrations, including steady-state, suddenly-beginning, digital, and trace-matching analyses is presented in the fourth chapter. The concluding chapter considers damage criteria, both American and European, along with the structural and physiological effects of blast vibrations. Mr. Bollinger’s skillful exposition

of each of these topics starts at an elementary level—assuming some college engineering or scientific background—proceeds to an intermediate stage, and then suggests directions for more advanced study. While the theoretical presentation is kept general, specific examples and certain relevant points are made with reference to Sprengnether seismic instruments.

Each chapter is followed by a list of references, and a bibliography of the field of engineering seismology as a whole appears at the back of the book. Numerous informative tables, figures, graphs, charts, mathematical examples, and photographs of instruments are included in the body of the text.

Scientific students and professionals will find Mr. Bollinger's book stimulating and suggestive of further ranges of study and practice.

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Editorial Review

Review

“This present work represents a successful attempt by a specialist in earthquake phenomena to deal with the basic elements of vibrations arising chiefly from blasting, but the theory and associated analysis are equally applicable to other causes of wave motion through strata. The book… takes the reader from physics of wave motion through generation, measurement, analysis and effects of vibrations…A happy balance is struck between theory and practice so that the two blend easily…

“The book can be recommended as a handy and concise reference for blasting engineers and… a good introductory textbook on the subject of vibrations.”
—**Robert Shepard**, *The Mining Engineer*

Bollinger “synthesizes the theory and literature from the seismological, geophysical, and engineering disciplines pertinent to the subject area of blast vibrations induced by quarrying, mining and engineering operations.”—*Mining Engineering*

About the Author

G. A. Bollinger is Associate Professor of Geophysics at The Virginia Polytechnic Institute and State University. He received his Ph.D. degree in geophysics from St. Louis University in 1967. Author of *The Earthquake History of Virginia* and of a number of articles which have appeared in such scientific journals as the *Bulletin of The Seismological Society of America* and the *Journal of Geophysical Research*, Mr. Bollinger is presently doing research in central Appalachian seismicity and in earthquake focal mechanisms.

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