

VIBRATIONS FROM UNDERGROUND BLASTING

James J. Snodgrass, Geophysicist

David E. Siskind, Geophysicist

ABSTRACT

The Bureau of Mines has investigated vibration levels produced by blasting at four underground sites to establish how such factors as type of explosive, delay blasting, charge weight, and geology affect amplitudes of ground motion. A summary of the work is presented and the results of further analysis of the data are discussed. Square root scaling was found applicable to two of the underground sites and could be applied with minor error to all the sites. Comparison of empirical propagation equations in the different rock types indicates that although the site effect is apparent, the combined data may be used as a basis for engineering estimates of vibration amplitudes from subsurface blasting in many different rock types. Recommendations for predicting and minimizing vibration amplitudes from underground blasts are given.

The prime units in the text, tables, and illustrations of this publication are the U.S. customary units. Where appropriate, the approximate equivalents in the International System of Units (SI) are included in accordance with the rules for introducing modernized metric units established in the National Bureau of Standards ASTM Metric Practice Guide, E380-70. In accordance with the SI convention, a space rather than a comma is used to separate the digits in a metric number such as 15 000. The U.S. customary numbers used throughout the report include commas, where necessary, to separate the digits. The period is used as a decimal point in both SI and U.S. customary numbers.

Abbreviations

U.S. customary units	SI units
in = inch	mm = millimeter
ft = foot	m = meter
lb = pound	kg = kilogram
sec = second	sec = second
mV = millivolts	V = volts
g = unit of gravity	