# NEAR-SOURCE ATTENUATION OF SEISMIC WAVES FROM SPATIALLY DISTRIBUTED SOURCES

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## ABSTRACT

Both theory and experience tell us that spatially distributed energy sources generate a more complex family of seismic waves than do point sources. The resulting effects in the near field (for cheese-in blasting) are significantly different than those from point sources although, at great distances from the source, the seismic waves take on many of the characteristics of point sources and can often be treated as such.

Under ideal conditions, and appropriate normalizing, the decay of seismic waves (attenuation) for a point source can be represented by two intersecting slope lines of the type

$$Y_a = m_1 X^{-a} \text{ and } Y_b = m_2 X^{-b}$$

For a line source and some types of area sources, the vibration decay line is a complex curve of the type

$$\log Y = k_1 - k_2 \log X - k_3.$$

For earthquakes, such a curve becomes asymptotic to the horizontal in the epicentral region. For a line of discrete source elements, such as a line of explosives charges or a fleet of seismic exploration vibrators, the slope flattens in the near-field, and reaches a discrete upper limit which is dependent on the energy in a single element in the source.

This paper offers a few selected examples from case histories covering the period from 1947 to the present. The examples were selected to illustrate the more significant near-field effects of several different types of sources. These case histories will help the reader to understand why this writer uses blast design parameters in his prediction formulae, as well as the more conventional parameters of charge weight per delay, distance and site geology. The case histories will illustrate some of the relative influences of different parameters.