CHARACTERISTICS OF EXPLOSION-GENERATED WAVES IN LIMESTONE AT SMALL DISTANCES

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Explosion-generated seismic waves are the bases of two important practical applications of seismology; the seismic method of subsurface exploration, and the study of the effects of quarry and other blast vibrations on building structures.

Published work on the subject can be divided into two categories: pressure and strain measurements made within meters of the shot, and seismic analyses of ground motion recorded at hundreds of feet from the source.

A review of this literature indicates that the nature of the seismic wave is dependent, among other factors, upon the rock material in which it originates, and the distance at which it is observed.

This investigation is a seismic study of the waves originating in the Saint Louis limestone, as recorded at 15 and 25 meters. This is an area not covered in the two types of study described above.

Small, single shots were fired near the surface in the Saint Louis limestone, and recorded on three component seismographs resting on the same rock material. Amplitude and particle motion analyses were made of the waves coming directly from the

shot, of waves reflected off a free vertical boundary, and of waves resulting from shots which broke rock out of the vertical face.

Conclusions reached from this study include the following:

1. High frequency (40 to 75 c.p.s.) and short duration (0.1 seconds) ground motion was characteristic of the waves generated in the Saint Louis limestone.
2. Classical wave types P, SH, SV, and R were recognized and found to occur consistently at these short distances.
3. The same type waves were found to be reflected from the free boundary, unaltered except in amplitude.
4. The loss in amplitude upon reflection is most probably due to increased attenuation and scattering with increased distance of travel.
5. The shots that moved rock out of the face produced the same wave types as the other two but amplitudes were greatly decreased.
6. Attempts to determine attenuation characteristics and velocity values were unsuccessful.