

A LINE SOURCE OF SH WAVES OVERLYING A
PLANE BOUNDARY SEPARATING TWO
SEMI-INFINITE ELASTIC MEDIA

Jesse Theodore Cherry, Jr., B. S., M. S.

Digest

A Digest of Dissertation Presented to the Faculty of the
Graduate School of Saint Louis University
in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Philosophy

1961

A LINE SOURCE OF SH WAVES OVERLYING A
PLANE BOUNDARY SEPARATING TWO
SEMI-INFINITE ELASTIC MEDIA

Jesse Theodore Cherry, Jr., B. S., M. S.

Digest

A line source of horizontally polarized shear waves located above a plane boundary is capable of producing a direct, refracted and reflected SH wave. The reflected and refracted waves were treated as perturbations necessary to satisfy the continuity of stress and displacement at the plane boundary. Since the Laplace transform of the entire problem was taken, Cagniard's method was used to find the inverse. This technique allowed the solution to be programmed on the IBM 610 computer. The cases considered showed that the precursor of the totally reflected wave and the head wave are fundamentally the same. It was concluded that the energy arriving between the head wave time and the total reflection time was the result of events striking the boundary at intermediate angles. Each event generates a head wave at the interface which produces radiation back into the upper medium causing the displacement at a point to vary continuously between the above times. It was also shown that the phase associated with the reflection coefficient produces enough distortion in the reflected event to make the term

"total reflection" very misleading.

Various aspects of elastic wave propagation in a homogeneous isotropic solid were also investigated. In particular, the conditions for amplitude variation over a wave front were discussed and an example was given of a plane compressional wave with displacement components both normal and tangent to the wave front. Also an SH source of spherical waves having a particular amplitude variation was transformed into cylindrical coordinates in order to compare this source with the line source used above.