

An exact solution is derived in this Memorandum for the problem of an elastic half space whose surface is excited by an expanding, concentrated ring of pressure. The ring is assumed to suddenly emanate from a point on the surface and then to expand radially at a constant rate over the surface.

Using multiple integral transforms, the displacements are derived for all points of the half space in the form of single integrals. Each integral is identified as the disturbance behind a specific wave front. The entire displacement field is found to be composed of two systems of waves: direct waves which emanate from the initial position of the ring as if they were generated by a point force, and waves that propagate from under the ring in a manner that depends on the rings rate of expansion relative to the body wave speeds.

The integral form of the solution is exploited to analytically evaluate the displacements at the wave fronts, under the ring of pressure, and at the arrival of the Rayleigh surface wave. It is shown that in the far field the major disturbance near the surface of the half space is due to the Rayleigh wave, not the overriding ring of pressure. The displacements are also evaluated numerically for the case in which the ring expands at a rate less than or equal to the slowest body wave speed.

A method of obtaining the displacements due to an expanding, distributed surface load by superposing ring load solutions is outlined. The case of a decaying pressure profile is used as an example.