

## **Nondestructive testing of concrete structures using the Rayleigh wave dispersion method**

Krstulovic-Opara, N., Woods, R.D., Al-Shayea, N.  
ACI Materials Journal  
Vol. 93, Issue.1, 1996

**Abstract:** This paper presents the Rayleigh wave dispersion method, which shows great potential for nondestructive testing (NDT) of concrete structures. Its application allows both the determination of stiffness profiles within a structural element and monitoring of concrete curing as a function of time and depth. The method constitutes an improvement over conventional stress-wave techniques used in NDT of concrete structures that are capable of determining only average wave velocity along a specific path. Thus, conventional methods can neither evaluate changes in material qualities (e.g., stiffness) with depth, nor the position of defects within a layered section. This novel method, also called the spectral analysis of surface waves (SASW) method, is based on the generation of low-amplitude Rayleigh waves at a broad range of frequencies from which shear wave velocities and elastic moduli profiles are determined. The method was developed primarily for determining stiffness profiles and thicknesses of "larger" layered systems that satisfy conditions for an infinite half-space, such as layered soils. Nevertheless, the method has already been successfully used in flexible pavements and concrete elements satisfying conditions for an infinite half-space, such as concrete tunnel liners. This suggests that the SASW method could be successfully employed for NDT of other concrete elements. The goal of the reported research was to evaluate if this method could be used for NDT of concrete structural elements that do not satisfy conditions for an infinite half-space. Presented in this paper are basic concepts of the SASW method, results of a nondestructive evaluation of a model concrete wall using the SASW method, and directions for future research.