

Subsurface Cracking Surveillance Instrumentation Needs – Instrumentation Rodeo Nelson Gibson, FHWA

Classical bottom up fatigue cracking is one major distress measured during test track and APT facility experiments. Crack mapping and quantifying crack length and percent cracked seems to be the state-of-the-practice. However a major flaw with this approach is the crack must reach the surface in order for it to “count”. Crack initiation instances and propagation rates go unchecked. Further, to the untrained eye, it may be possible to count a bottom down type of crack as a bottom up type of crack. Of course destructive coring is a reliable method to verify cracking characteristic but this could influence the experiment.

Surface wave measurements enable the modulus of a pavement material to be calculated based on theory. The Portable Seismic Pavement Analyzer, PSPA (www.geomedia.us), is one commercially available device. FWD and light weight deflectometer are another variant. Changes in calculated stiffness may be used to assess changes in material stiffness which may be associated with cracking. Quality of the waveform from the geophones may be a method to interpret subsurface cracking. Ultrasonic devices, specifically a handheld device being studied by Lev Khazanovich and Mihai Marasteanu at the University of Minnesota have been working with a handheld Russian device that operates on ultrasonic principles to evaluate crack severity. This could definitely be further probed. Recently next-generation ground penetrating radar (www.3d-radar.com) is being studied at FHWA. The novel GPR uses step-frequencies rather than an uncontrolled pulse and claims greater resolution and detail over conventional GPR.

Overall Need – Essentially the challenge goes to engineering instrumentation vendors and nondestructive equipment vendors to solicit what future direction should be investigated to assess cracking in pavements which have not reached the surface.