

## ABSTRACT

Imbrock, Paul A. M.S.C.E., Purdue University, August 2013, Detection and Mitigation of Concrete Pavement Joint Deterioration.

America's highway infrastructure is a critical component to the overall wellbeing of the economy and the country. Maintaining this infrastructure is vital to ensuring that goods, as well as people, can make their way across the country safely and on time. It is critical that this infrastructure be maintained, while traffic congestion is minimized. Extending the service life of concrete pavements can go a long way towards lessening this burden. If each pavement lasts longer, the money that would have been used to repair or replace it can be used to build new pavements or enhance areas of the network that are insufficient. This will also reduce the amount of needed rehabilitation construction, which can cause traffic congestion and delays.

One issue that is causing many concrete pavements to require attention before the end of their service life is the premature deterioration of the saw-cut joints. These joints are susceptible to fluid ingress which can lead to damage in the concrete from freezing and thawing cycles or deicing salts. This thesis will investigate early detection systems which utilize ground penetrating radar (GPR)

and surface electrical resistivity in order to determine if a pavement joint is adequately protected from the environment or if it may be susceptible to damage. Laboratory studies have shown that these systems can detect the depth of standing fluid in the joint.

A solution for mitigating damage in areas that have been determined to be potential risks will also be presented. The successful laboratory studies of soy methyl ester – polystyrene (SME-PS) sealant will be transferred to field trials. These studies have demonstrated that SME-PS is an efficient, economical method of limiting the ingress of water and salts that create hazards to joints. It has been shown that large scale application of SME-PS is a simple process, and to-date, has been an effective means of mitigating joint deterioration.