

ABSTRACT

Wiese, Andrew Stuart M.S.C.E., Purdue University, August 2015. Assessing the Performance of Sustainable and Luminescent Concrete Sealers. Major Professor: Jason Weiss.

SME-PS is an alternative sealer that has been put through a variety of tests and has shown to be effective at protecting and thereby increasing concrete service life. Made from soybeans and waste styrofoam, SME-PS is inherently better for the environment compared to other sealers. SME-PS is hydrophobic and therefore reduces the ingress of water and deicers; moreover, it has proven to have similar performance in shorter, more aggressive tests.

However, a need exists to understand the performance of SME-PS over a longer period of time implemented in field trials compared with existing sealer methods. To address this need, approximately 4 years ago two field locations, one on US 231 in Lafayette, Indiana and another on 126th Street in Fishers, Indiana were sealed with SME-PS.

This work revisits these sites to identify any new damage, if any, since the time of SME-PS application. Cores were taken from the two sections and compared using the titration technique to determine chloride ingress. One observation made while preparing some of the cores for titration was that the depth of the saw cut varied greatly. This was noted when interpreting those titration results. SME-PS showed similar performance compared to the filler/backer rod sealer and shows a reduction in chlorides of about 50% when compared to unsealed joints. This was the first field sampling and it is important to continue sampling in order to determine how long the SME-PS compares with current sealers over a longer duration of time. This will help users understand how long SME-PS can be expected to seal their concrete and when reapplication is recommended. Following a regular maintenance plan can help squeeze more life out of concrete elements meaning more savings for the customer long term.

The second portion of the work highlights use of SME-PS for use with a luminescent powder. The luminescent powder, strontium aluminate; slowly luminesces after being excited by light. The GITD concrete sealant could be used to seal concrete for increased service life, supplement streetlights, and increase the safety of the travelling public at night. A test procedure was developed for lab and outside conditions to quantify the magnitude and duration of the luminance of the coated concrete surface, which is key to evaluating the performance of the luminescent sealant. The results of the tests performed indicate the luminescent surface emits light (i.e., glows) for approximately 1 to 50 hours in a dark space after excitation depending on application rate, particle size, and exposure time and orientation in the field.