

# **Tenth Annual Pennsylvania Concrete Conference**

## **Poster Presentation**

### **Majestic Foyer/Grande Ballroom**

**J.J. Gutiérrez, J.M. Vandenbossche and Feng Mu**

**University of Pittsburgh**

#### **EVALUATING THE JPCP CRACKING MODEL OF THE MECHANISTIC-EMPIRICAL PAVEMENT DESIGN GUIDE**

Abstract:

At concrete set, certain temperature gradient is built into pavement slabs with zero stress generated. After traffic is loaded, zero environmental stress is only possible when the active temperature gradient equals to the built-in temperature gradient. This stress equivalent temperature difference is site dependent. The current state of MEPDG treats the built-in gradient as a variable, the magnitude of which is set free for the user to modify in case the local magnitude of this parameter is known. However, one finding of this study is that MEPDG (software version MEPDG ver. 1.0) predicts a minimum cracking at a constant value of built-in gradient equal to or close to -12 °F, regardless of climate. Such singularity contradicts to the understanding that if there is a safest built-in temperature gradient, then it should be site-dependent.

Moreover, this study suggests that the built-in gradient should be fixed to the default value of -10 °F, which is the value assumed for all the MEPDG calibration sites. MEPDG predictions are made with both -10°F and actual built-in temperature gradient (nearly 0°F) to Cell 5 to Cell 13 of Mn/ROAD and then compared to their field performance. MEPDG ver. 1.0 is theoretically capable of predicting damage for varying built-in gradients. However, the predictions with -10°F as the built-in temperature results match the field observation much better.

Large discrepancies between observation and performance prediction for the case of Mn/ROAD Test Site could be explained through sensitivity analysis. A linear regression technique is employed as a tool for sensitivity analysis of MEPDG. Six design parameters were coded and a  $2^6 = 64$  case experiment was conducted. The sensitivity of each input variable as well as their interaction is identified and ranked in a simple yet rational way.