World Academy of Science, Engineering and Technology
International Journal of Civil and Environmental Engineering
Vol:12, No:01, 2018

Temperature Distribution for Asphalt Concrete-Concrete Composite Pavement

Authors : Tetsya Sok, Seong Jae Hong, Young Kyu Kim, Seung Woo Lee

Abstract : The temperature distribution for asphalt concrete (AC)-Concrete composite pavement is one of main influencing factor that affects to performance life of pavement. The temperature gradient in concrete slab underneath the AC layer results the critical curling stress and lead to causes de-bonding of AC-Concrete interface. These stresses, when enhanced by repetitive axial loadings, also contribute to the fatigue damage and eventual crack development within the slab. Moreover, the temperature change within concrete slab extremely causes the slab contracts and expands that significantly induces reflective cracking in AC layer. In this paper, the numerical prediction of pavement temperature was investigated using one-dimensional finite different method (FDM) in fully explicit scheme. The numerical predicted model provides a fundamental and clear understanding of heat energy balance including incoming and outgoing thermal energies in addition to dissipated heat in the system. By using the reliable meteorological data for daily air temperature, solar radiation, wind speech and variable pavement surface properties, the predicted pavement temperature profile was validated with the field measured data. Additionally, the effects of AC thickness and daily air temperature on the temperature profile in underlying concrete were also investigated. Based on obtained results, the numerical predicted temperature of AC-Concrete composite pavement using FDM provided a good accuracy compared to field measured data and thicker AC layer significantly insulates the temperature distribution in underlying concrete slab.

Keywords : asphalt concrete, finite different method (FDM), curling effect, heat transfer, solar radiation
Conference Title : ICTPE 2018 : International Conference on Traffic and Pavement Engineering
Conference Location : Bangkok, Thailand
Conference Dates : January 18-19, 2018

Open Science Index, Civil and Environmental Engineering Vol:12, No:01, 2018 publications.waset.org/abstracts/71084.pdf