

# **A GENERAL METHOD FOR CALCULATING TEMPERATURES IN LAYERED HIGHWAY PAVEMENTS**

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## **SUMMARY**

Diurnal extremes of temperature in hot, arid climates have resulted in premature surface cracking of asphalt pavements even in the absence of heavy traffic. Empirical models for the evaluation of pavement temperatures exist but are limited in scope and can only be used in applications similar to those for which the original data was obtained.

A theoretical method to achieve this is proposed which is based on the physical principles governing the process. The method takes account of: thermal energy absorbed by the pavement surface from solar radiation (insolation); convection between the air and the highway surface; re-radiation from the surface; and heat conduction through the pavement itself. The pavement structure was treated as a semi-infinite layered medium with one or two dimensional heat flow within the pavement layers.

The method was compared with observations of actual pavement temperatures published by other authors and excellent correlation was obtained. Further studies revealed a number of important characteristics of pavement temperature fluctuation. It was found that there is a time in the early evening when the surface temperature falls very rapidly making the surface layer susceptible to shrinkage cracking. The surface temperature is highly sensitive to surface colour, in particular in the vicinity of white or yellow road markings. A two-dimension solution of the equations showed that there was a significant variation in temperature in the close vicinity of these road markings.