

Temperature Distribution Through Asphalt Pavement in Tropical Zone

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ABSTRACT.

Temperature distribution through asphalt and the underlying layer have been obtained numerically using finite element method where a varying induced heat from sun and environment cause fluctuating temperature distribution throughout. The maximum effect of these parameters on the temperature of the asphalt is expected in summer, so the temperature distribution was studied in the summer only. Some interesting results were found; at tropical zone such as in Baghdad the asphalt surface temperature may reach (70°C) and it is reduced with depth. Due to fluctuating environment heat effect, the subsequent temperature of the asphalt and the underlying layer may fluctuate with some delay and damping depending on the layers thermal properties, these results may be used later to predict both the erosion rate of car tires and asphalt thickness, also the preserved energy using asphalt layer may be used to confine heat for further usage as in electrical generation.

Keyword: asphalt temperature, finite element method, tropical zone environmental, Solar heat gain and temperature measurements.

1. INTRODUCTION.

The temperature distribution through asphalt pavement had special importance due to its effect on the efficiency of braking in vehicles. The rate of erosion in the rubber of the tires is affected mainly by its temperature; also the temperature in asphalt is important due to its effect on the temperature of its environment such as building. The emission of heat from asphalt to the environment is a deep effect on the amount of heat received by the building and the subsequent increase in its temperature which highly affects the building thermal load.

So special attention has to be concentrated on this field. In this work the temperature distribution through a layer of asphalt was studied taking into account the influence of the environment and the heat flow through the layer of the asphalt. The benefit of determining temperature distribution through the asphalt can be extended to study the rate of erosion of the asphalt itself so the expected life of the asphalt road with good characteristics can be determined.

2. LITERATURE SURVEY.

A literature review was conducted to locate previous work done in the field of modeling temperature distributions in asphalt layers as a function of thermal environmental conditions. The more significant studies that deal with the same state are:

Pioneering research in the field of asphalt pavement temperatures was done by Barber [1]. Barber attempted to correlate pavement surface temperatures and temperatures at 3.5 inch depths with standard weather report information. The weather parameters used were wind speed, precipitation, air temperature, and solar radiation.

The research and analyses showed that when solar radiation was included in the analyses with air temperature, the sine curve approximation provided reasonable estimates of asphalt surface temperatures.