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# LOW TEMPERATURE TRANSVERSE CRACKING OF ASPHALT CONCRETE PAVEMENTS IN CENTRAL AND WEST TEXAS

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# Low Temperature Transverse Cracking of Asphalt Concrete Pavements in Central and West Texas

by
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Excessive transverse cracking has been observed on highways in parts of Texas that are subject to severe weather conditions. These cracks are appearing much earlier and with a greater frequency than cracks caused by conventional load related mechanisms. The rising maintenance costs for these roads have prompted research into the causes and cures of transverse cracking in Texas.

The climate in the western half of Texas is potentially damaging to susceptible asphalt concrete pavements. Incoming storm systems bring dramatic temperature drops to the Panhandle Region while cloudless skies over the far western portions of the state subject pavements to extremely high solar radiation exposures. These areas undergo excessive day to night temperature cycling throughout the year. Such conditions place extremely broad demands on asphalt-aggregate mixtures. Paving mixtures must have sufficient mass viscosity to meet stability requirements, and yet have the capacity to effectively resist age hardening and fatigue failures.

The report summarized in these pages investigates the significance of low-temperature cracking as it relates to pavements in Texas. The bulk of the data was obtained from cored samples taken periodically from over 50 highway projects throughout the state. From this base a hardening model was developed and pavement performance studied. In addition, controlled laboratory studies of asphalt specimens called "pizzas" were made. These studies were designed to assess the effect of factors such as asphalt content, compactive effort, solar radiation and special additives on age hardening.

Throughout this report the emphasis is on studying the causes and significance of low-temperature transverse cracking in West Texas. Some possible cures are reviewed: a) special additives to retard hardening, b) a new screening test for asphalts which simulates hardening by solar radiation, and c) modification of design and construction standards. The problem is a complex one and a costly one in terms of maintenance. In fact, a whole new maintenance strategy may have to be de-

signed to cope with it. The ideal situation, however, is to design and construct new highway facilities so that transverse cracking will be minimized.

In summation of the report's contents an evaluation of the relation between asphalt hardening, thermal forces and pavement cracking in Texas is made. Thermally induced cracking of hardened pavements is found to be a potential failure mechanism in West and Central Texas. Factors affecting asphalt hardening susceptibility are studied. The form of a generalized model for predicting hardening of asphalt as a function of time is proposed. Recommendations regarding the type of asphalt to be used in West and Central Texas are made.

The published version of this report may be obtained by addressing your request as follows:

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