BACKGROUND

Transverse cracking of asphalt pavements has been a problem which has been in existence since asphalt was first used as a pavement material. The suggested causes for this phenomenon consists of, but are not limited to, ambient temperature changes, temperature susceptibility of the asphalt, grade of asphalt, mix stiffness, subgrade, etc. Maintenance of these cracks has likewise been a problem in that, because of other work interferences such as snow storms, crack filling and sealing efforts range from very extensive to none at all. Cracks which are not sealed at an appropriate time tend to deteriorate much more rapidly and cause an unsatisfactory riding quality. This, in turn, accelerates the need for more extensive repairs and resurfacing or rehabilitation.

Through the years, there has been much research and many reports have been written on the subject of eliminating or reducing the amount of transverse cracking in asphalt pavements. Most of these have indicated that transverse cracking can be reduced through mix design procedures and asphalt grade and quality controls. There does not seem to be any follow-up reports which allude to any significant success in the use of any of these procedures.

At a pavement management study meeting in Omaha, Nebraska, September 12 and 13, 1979, the states of Iowa, Kansas and Nebraska agreed on the need for an in-depth engineering study of thermal cracking of bituminous pavement. In addition, the states of Oklahoma and North Dakota agreed to participate in the study.

The scope of the study was to analyze all functions relating to the thermal cracking problem to determine how different uses of preventative materials, mix design measures, maintenance repairs, and design of bituminous pavements and overlays might be contributing to the problem and to determine what improvements might be made in these procedures to reduce the problem of thermal cracking.

CONCLUSIONS

The scope of this study addresses the possibility of improved mix design procedures as a means of reducing the amount of transverse cracking and the problems associated with it. The study also addresses the use of maintenance procedures as a means of reducing crack deterioration, thus extending pavement life and special crack treatments which might be used at the time pavements are rehabilitated as a means of reducing crack reflection and further crack deterioration. The study does not address what we believe to be the major contributor to transverse cracking which is the subgrade and subbase.

In preparing for the meetings which were held to discuss the many problems associated with this study, considerable investigation and review of prior work was necessary. Much of this work and information is not discussed in this report but rather was contained in handouts and minutes of the meetings.

Conclusions which can be derived from the total study are as follows:

1. It does not appear that current mix design practices can be expected to do little more than minimize transverse cracking.
2. Iowa's current mix design procedures for binder and surface courses are in line with those recommended through various research reports.
3. Most of the deterioration stripping at transverse cracks occurs in the base course indicating a need for more concern in design of asphalt treated bases.
4. Transverse cracking is more severe when placed on subbases or bases containing portland cement or lime.
5. Cracks which have been effectively sealed are not as badly deteriorated as those which have not been sealed.
6. Improved crack cleaning prior to sealing is necessary to permit effective sealing. High pressure water-blast cleaning exhibits potential as an improved method of crack preparation.
7. An improved crack sealant material is needed both for maintenance and crack repair prior to resurfacing.

8. There are no treatments currently available which will effectively reduce transverse crack reflection, particularly if the crack is temperature related.
9. The use of fabrics in conjunction with overlays can eliminate, or substantially retard longitudinal and some fatigue type cracking. Fabrics will not prevent reflective cracking of a moving or working joint or crack.
10. Heater scarification can economically correct minor surface distortion and shallow surface cracking (1" or less).
11. Control of reflection cracking with an overlay is directly related to the thickness of the overlay.
12. Full depth patching is a very costly repair technique. In the future, some savings might be realized by the use of the new milling equipment and development of special compaction equipment.
13. Pavement design should be modified to provide better underslab drainage.

RECOMMENDATIONS

Transverse cracking is a phenomenon which has been with us since asphalt was first used as a paving material. There has been a lot of research, a lot of reports have been written and there has been a lot of discussion of the subject. While some reports have

suggested ways in which transverse cracking can be reduced, none have offered a positive suggestion for stopping it. Recommendations which arise from these reports generally suggest a need for further research.

From the results of our participation in this study, we too would recommend the need for further research. During the interim period, there is a need for concerted efforts in minimizing cracking through mix design, reducing deterioration through better maintenance and reducing reflection cracking through improved surface preparation procedures. The following recommendations are offered for consideration:

1. Continue to seek ways of improving the quality of asphalt treated bases without significant increase in cost.
2. Continue to evaluate the results of recently adopted changes in requirements for binder and surface courses.
3. Adopt a positive procedure requiring timely sealing of cracks.
4. Continue research designed to evaluate procedures which will reduce cracking and crack deterioration.
5. Strengthen specifications for preparing pavement surfaces for overlays.