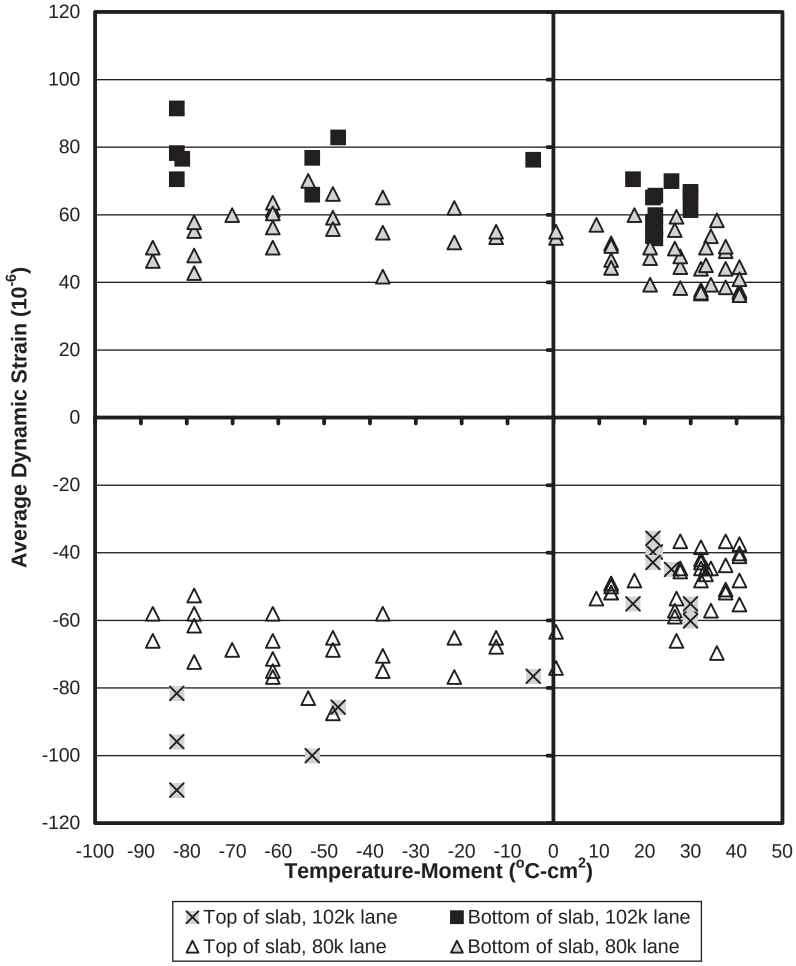

FIGURE 7 Average dynamic strain near leave side of joint, outside wheelpath, for late spring 2001.

On the leave side of the joint in the outside wheelpath for the same late spring period, the response is notably different. As indicated in Figure 7, for large negative temperature-moments, the 102k response is nearly 60% larger. The increase in dynamic strain response with decreasing magnitude in temperature-moment is also more pronounced. Strain response magnitude for the positive temperature-moment region remains similar to that for the approach side of the joint. The difference in behavior between the two sides of the joint is to be expected, because the joints are not doweled and the large number of repetitions of the large 102k load are decreasing load transfer efficiency of the joints very rapidly. Recent joint load transfer efficiency testing has demonstrated this trend.

Environmental conditions in the late fall period of December 6 to 7, 2001, result in much less variation in temperature-moments. Figure 8 indicates that the dynamic strain responses for the 80k loading (leave side of joint, outside wheelpath) are similar in magnitude and behavior to the late spring period. The significantly larger response from the 102k loading, however, shows up at much lower temperature-moment values.

Figure 9 presents the dynamic strain responses for the leave side of the joint in the inside wheelpath, 80k lane, for three of the seasons in 2001. The responses show less variation and slightly lower values than for the outside wheelpath. Reinforcing tie steel and additional aggregate interlock from the centerline joint may have an effect on the dynamic strains measured in this location. The noticeable drop in overall dynamic response for the early spring period is clearly indicated in Figure 9, a result of the frozen conditions in the subgrade and base layers during that time.

CONCLUSIONS

Test Cell 32 at Mn/ROAD was constructed to study the behavior of a thin, low-cost PCC pavement subject to heavy traffic loads and Minnesota's extreme weather conditions. This study describes the physical aspects of Cell 32 and results from seasonal load response testing conducted throughout 2001. Environmental and load-related factors to be considered in this type of study were described to benefit future research in this area.

Analysis of the data demonstrated that, for the truck speeds involved in this testing, there were minimal effects on the measured dynamic strain. Nonlinear temperature profiles in the slabs prompted the use of the temperature-moment concept in the analysis. Periods of conditions that cause joint closure, which may

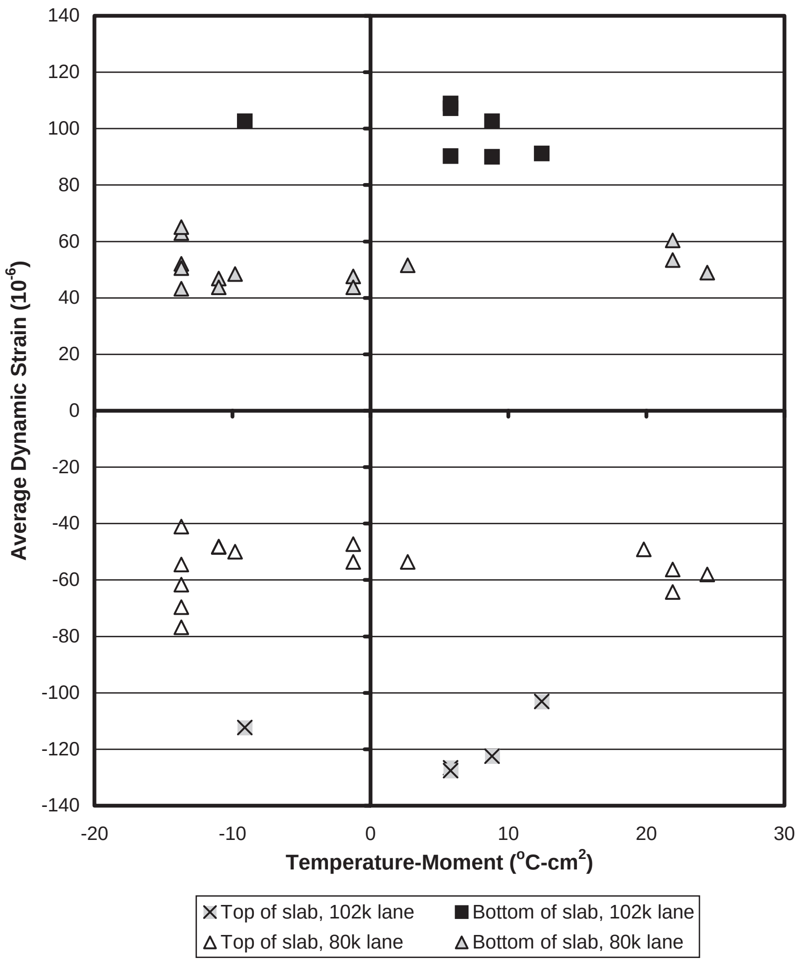

FIGURE 8 Average dynamic strain near leave side of joint, outside wheelpath, for late fall 2001.

affect the measured dynamic strain, were determined and removed from the analysis.

For the approach side of the joint in the slabs, during periods with unfrozen base and subgrade layers, there is only a small increase in the dynamic strain response with decreasing temperature-moment. Average dynamic strain responses range from 50 to 80 microstrain, with little difference in magnitude between the 80,000- and the 102,000-lb loadings. For the leave side of the joints in the slabs, there is a larger increase in dynamic strain response with decreasing temperature-moment. In addition, the 102k load response is nearly 60% larger than the 80k load response for large negative temperature-moments. Recent joint load transfer efficiency testing has indicated significant differences in response when loading the two sides of the joints, thus providing support to the dynamic strain response behavior found in this study.

The results from this study will be useful in developing or improving fatigue distress models used in mechanistic-empirical design methods for low-volume PCC pavements. Continued seasonal testing of Cell 32 at Mn/ROAD will provide valuable information for future studies of thin PCC pavement behavior.

RECOMMENDATIONS

Based on analysis of the data in this study, the following changes could be made to improve dynamic load testing:

1. Data should be collected from as many truck runs as possible throughout each day for several days each season. Testing over more continuous time periods captures the effects of wider ranges in temperature-moment.
2. Channel the test truck over specific areas of interest in the slabs to gain more meaningful information. Until a correction factor for tire offset is formulated, less variation in tire offset results in larger quantities of data for analysis.
3. Conduct additional tire offset testing to help formulate correction factors for strain values.

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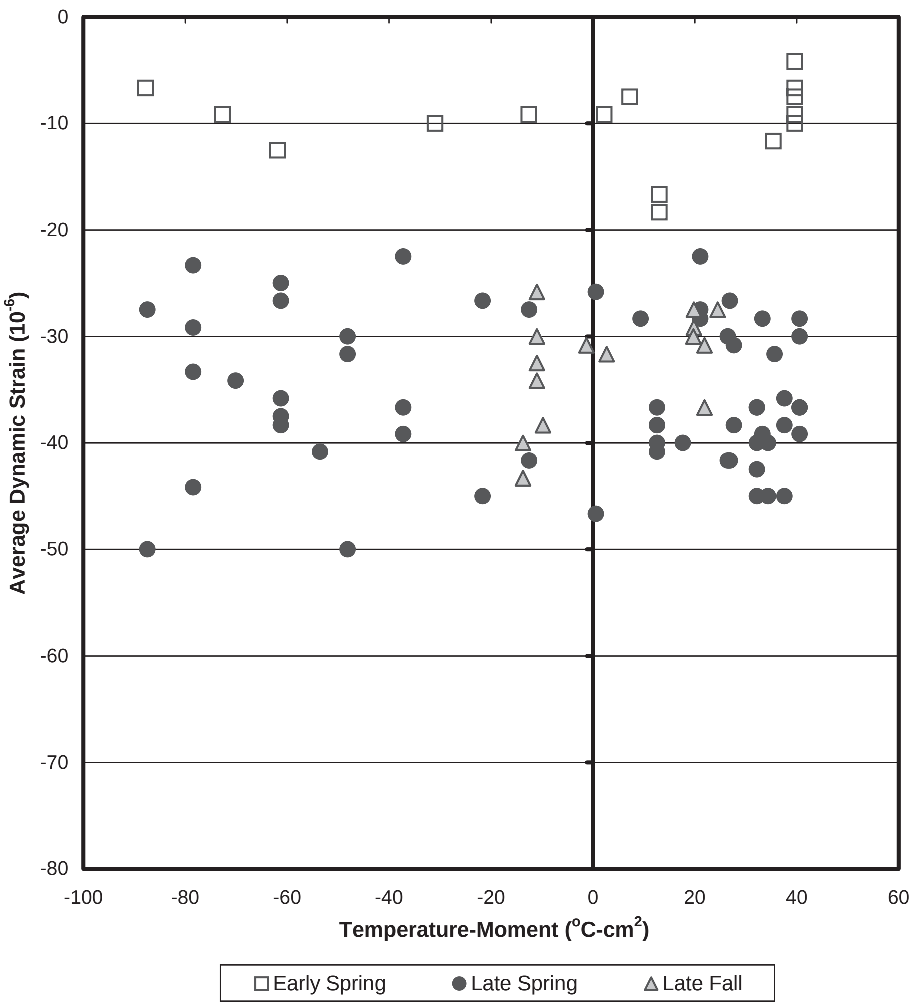

FIGURE 9 Seasonal average dynamic strain near leave side of joint, inside wheelpath, 80k lane, top of slab.

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