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FIELD EVALUATION OF STRIPPING AND MOISTURE DAMAGE IN ASPHALT PAVEMENTS TREATED WITH LIME AND ANTISTRIPPING AGENTS

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PROBLEM STATEMENT

As research and experience have shown, asphalt pavement mixtures are extremely susceptible to moisture damage. While such damage can range in severity, the greatest damage is represented by stripping, a condition in which a binding material is separated from the surface of an aggregate either by the action of water alone, or by the interaction of traffic loads, temperature, and water. This action in turn can lead to collateral pavement distress, including shoving and rutting, fatigue cracking, bleeding, and flushing. In the U.S., where this problem is particularly rampant, the result has been reduced pavement performance and increased maintenance costs. To stem the spread of such damage, over the last 10 years researchers have developed two approaches. The first involves the use of various tests and procedures designed to evaluate the moisture damage potential of asphalt-aggregate mixtures. Because there are several versions of the same test, and because several different acceptance criteria are used (yielding conflicting predictions of moisture damage potential), these tests have not proved effective. A second and more useful approach has been the attempt to minimize or eliminate moisture damage by treating the asphalt mixture with an antistripping agent, such as hydrated lime or other commercially available antistripping additives. While both engineers and researchers generally report good results with hydrated lime, questions remain regarding the tests, the acceptance levels, and the long-term effectiveness of all antistripping additives, including hydrated lime. For example, the introduction of hydrated lime in an asphalt mixture has been known to cause various construction problems that result in increased costs. This, together with the fact that many of the other liquid additives are less expensive, has persuaded many states to accept both lime and liquid antistripping additives, with preference given to the less expensive additives. Thus, what is now needed, and what this project undertakes, is an evaluation of the long-term effectiveness of hydrated lime and other antistripping agents.

OBJECTIVES

The Center for Transportation Research (CTR) of The University of Texas at Austin, in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration, conducted a study to evaluate the long-term effectiveness of hydrated lime and various other liquid antistripping additives under field conditions. Associated with this were the following related objectives: (1) evaluate the field performance of different mixtures using different antistripping agents; (2) establish the relationship between various moisture susceptibility test values;

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(3) correlate test values to performance; and (4) develop a predictive performance model.

FINDINGS

In pursuing the objectives, the CTR study team developed and undertook both field and laboratory testing in cooperation with TxDOT. The field component of this study involved the construction of eight highway test projects in eight different districts that, overall, encompassed a range of traffic and climate conditions, asphalt cements, and aggregates. (All field test sections were constructed as the surface course of pavement overlay.) The lab portion included field core sampling, testing of field cores using a wet-dry indirect tensile strength test, testing of core material using the Texas boiling test (Tex-530-C), and test section condition surveys.

In the field section experimental design, hydrated lime and two or more commercially available antistripping additives were included in each project. In addition, sections having no additive were included as a control. The actual selection of the antistripping additives was based on the experience and recommendation of district personnel, as well as on the willingness of the additive manufacturer to participate. Overall, fourteen different antistripping additives, including hydrated lime, were used in the eight projects.

Lab analyses using the wet-dry indirect tensile strength test as an indicator of stripping susceptibility showed lime to be generally less stripping susceptible than control mixtures. Stripping susceptibility of mixtures containing other additives—as compared with control mixtures—was dependent on the specific aggregate/asphalt/additive combination used.

Lab analyses using the Texas boiling test (Tex-530-C) as an indicator of stripping susceptibility indicated that additive effectiveness varied according to the specific aggregate/asphalt/additive combination.

Rankings of additive effectiveness using wet-dry indirect tensile strength tests and Texas boiling tests (Tex-530-C) were the same for two of the eight districts. Laboratory testing indicated that none of the antistripping additives applied increased the potential for moisture damage in the pavement mixtures.

In the condition surveys, the project staff found very little evidence of distress directly related to moisture damage in general or to stripping in particular (to date). This finding suggests that the moisture damage is occurring so slowly that it cannot be detected in test sections only 2 to 4 years old, and that any corroboration of the laboratory analysis by field evidence will require more time.

CONCLUSIONS

The laboratory evaluation indicated that there are differences in the stripping susceptibility of mixtures with various treatments; but because the project found little evidence of pavement distress that could be attributed directly to moisture damage, the researchers recommend that current TxDOT procedures and specifications continue, pending results of the long-term study of the test pavements constructed as part of this study.

"The information described in this summary is reported in detail in Research Report 441-2," March 1991.