TEXAS FREEZE–THAW PEDESTAL TEST FOR EVALUATING MOISTURE SUSCEPTIBILITY FOR ASPHALT MIXTURES

Thomas W. Kennedy, Freddy L. Roberts,
Kang W. Lee, and James N. Anagnos

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Foreword

Research Report 253-3 is the third in a series of reports describing the findings of Research Project 3-9-79-253, "Moisture Effects on Asphalt Mixtures." This report includes a discussion of the development of the Texas Freeze-Thaw Pedestal Test for evaluating moisture susceptibility of asphalt mixtures, a detailed description of the test method, and instructions on its use for distinguishing between stripping and nonstripping asphalt mixtures or individual aggregates.

Introduction

Water-induced damage of asphalt mixtures has produced serious distress, reduced performance, and increased maintenance for pavements. This damage mainly occurs due to stripping of the asphalt from aggregate surfaces. In an attempt to reduce the problem, various antistripping agents have been incorporated into asphalt mixtures. Unfortunately, a laboratory technique has not been available to reliably evaluate their potential effectiveness or to evaluate prospective aggregate-asphalt combinations to determine their water susceptibility prior to placement in the field.

In response to the above problem the Center for Transportation Research and the Texas State Department of Highways and Public Transportation initiated a research project to study water-induced damage to asphalt mixtures in Texas. A portion of this study includes evaluations of various proposed laboratory test methods for ascertaining the water susceptibility of asphalt mixtures.

Preliminary tests conducted as part of this study indicate that this test method is capable of distinguishing between mixtures that strip in the field and those that do not. The procedure is designated as the Texas Freeze-Thaw Pedestal Test.

Texas Freeze-Thaw Pedestal Test

The procedure tests the water susceptibility characteristics of an asphalt-aggregate mixture by determining the number of freeze-thaw cycles a specimen can withstand before cracking. A cylindrical specimen with a diameter of 41.33 mm (1.627 in.) and a height of 19.05 mm (0.750 in.) is compacted using the proposed job mix formula except that about 2 percent additional asphalt is included over that prescribed for the field mixture. The specimen consists of uniformly sized aggregate which passes the No. 20 and is retained on the No. 35 sieve. Use of a uniform sized material minimizes the effect of aggregate interlock while maximizing the effect of the bond between the aggregate and the asphalt cement. The compacted specimen is then placed on a beveled pedestal in a jar, covered with distilled water, placed in a temperature-controlled room, and subjected to thermal cycling. The specimen is cycled until failure occurs by cracking.

Types of Application and Use

Since the purpose of the test is to evaluate the susceptibility of an aggregate-asphalt mixture to moisture damage prior to use in the field, these evaluations can include

(1) proposed aggregate-asphalt mixtures;
(2) various components of the aggregate mixture;
(3) new aggregate sources; and
(4) proposed remedial measures, such as washing aggregate, crushing aggregate, adding commercial liquid antistripping agents to the asphalt, and treating the aggregates with lime.

Application to Evaluate Materials

The Texas Freeze-Thaw Pedestal Test was performed to determine if results could be used to differentiate between aggregate-asphalt mixtures which strip and those which do not. Mixtures from eight projects, four which had previously experienced stripping and four which had not, were used in this evaluation. There was a tendency for the stripping materials to crack in less than 10 cycles, but the nonstripping materials did not crack even after 25 cycles. These laboratory results provide an excellent matchup with field performance. It appears that the Texas Freeze-Thaw

Pedestal Test offers significant potential for detecting asphalt mixtures that are potential strippers in the field.

Utilization of Results

Results to date show that the Texas Freeze-Thaw Pedestal Test can be used to detect asphalt mixtures that will exhibit stripping tendencies in the field. Because of the potential offered by this test, the following utilizations are recommended:

(1) that both District and D-9 laboratories begin to use the Pedestal Test to evaluate selected field mixtures for those Districts that have experienced moderate to severe stripping problems;
(2) that, in the event a stripping mixture is detected, the proposed antistrip additive be tested using the Pedestal Test to evaluate its effectiveness;
(3) that samples of materials from pavements that have experienced stripping in the field be secured and tested to determine whether this test detects those stripping mixtures.

KEY WORDS: stripping, water damage, Texas Freeze-Thaw Pedestal Test, asphalt, asphalt concrete mixtures, stripping aggregates, stripping mixtures

The research reported here was conducted for the Texas State Department of Highways and Public Transportation in cooperation with the U.S. Department of Transportation Federal Highway Administration.

The full text of Research Report 253-3 can be obtained from Mr. Phillip L. Wilson, State Transportation Planning Engineer; Transportation Planning Division, File D-10R; State Department of Highways and Public Transportation; P.O. Box 5051; Austin, Texas 78763.