LTRC RESEARCH PROJECT CAPSULE

JULY 2010

10-2C

TECHNOLOGY TRANSFER PROGRAM

JUST THE FACTS

Start Date:
July 6, 2010

Duration:
6 months

End Date:
January 5, 2011

Funding:
State

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SPECIAL POINTS OF INTEREST:

- Problem Addressed
- Objectives of Research
- Methodology Used
- Implementation Potential

Validation of Correction Factors for Concrete Coefficient of Thermal Expansion

PROBLEM

A memorandum was issued by Federal Highway Administration (FHWA) to take an action on the "Concrete Coefficient of Thermal Expansion Input for MEPDG." According to the memorandum, FHWA has identified a problem with the American Association of State Highway Transportation Official (AASHTO) TP 60-00 provisional test method used to measure the coefficient of thermal expansion (CTE) for concrete. The CTE value of the calibration specimen (304 stainless steel) used to calibrate the test frame was based on literature values (17.3 microstains/°C) instead of the actual CTE value (15.8 microstains/°C) based on the temperature range specified (10–50°C) in TP 60-00. The use of the incorrect CTE value for the calibration specimen has also resulted in a higher CTE value for the specimen being tested according to TP 60-00. To fix this problem, AASHTO adopted the T 336-09 test method to replace the TP 60-00 provisional test method.

The memorandum extends the caution for state highway agencies (SHAs) to use the CTE value for an input in the AASHTO Mechanistic-Empirical Pavement Design Guide (MEDPG), interim edition. As many researchers identified, the CTE value is a sensitive input for the MEDPG and will affect the concrete pavement design. The interim edition of MEPDG was calibrated with the long-term pavement performance (LTPP) database with the incorrect CTE value measured according to TP 60-00. By having the corrected CTE value due to the change in the CTE of the calibration specimen can result in a significant bias in the predicted distresses when compared with the measured values in the LTPP database. FHWA adjusted the LTPP database of the CTE value based on the changes described above. A research proposal has been approved for NCHRP 20-07 funding to recalibrate the concrete models in the MEPDG to account for the change in CTE values and expected to complete by spring 2010.

OBJECTIVES

This study will measure the correct CTE of the specimen used for the LTRC project 07-02C in accordance with AASHTO T 336-09 and find correction factors to convert the CTE values measured by AASHTO TP 60-00 without further measurements.

METHODOLOGY

To complete the objectives, AASHTO T 366-09 results will be compared to ASHTO TP 60-00 results. The results will then be used as input values for the MEPDG and the results evaluated.

Major changes between AASHTO TP 60-00 and AASHTO T 336-09 will be reviewed and the implication of the changes will be investigated. Since the commercial automated divide (HM-251) is used to measure CTE value, the software that controls the testing procedure should be upgraded to account for the difference in CTE values for the calibration specimen.

After the software is upgraded, the correct CTE of the specimen used for the LTRC project 07-02C will be measured based on AASHTO T 336-09. By comparing the CTE value measured by AASHTO TP 60-00 and AASHTO T 336-09, the correction factors will be calculated to produce correct CTE values for duplicated specimen without further measurement.

IMPLEMENTATION

This project will greatly assist the Department in implementation of the Mechanistic-Empirical Pavement Design Guide. The updated CTE values will allow LADOTD design engineers to better predict long term portland cement concrete pavement performance.

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