

## JUST THE FACTS

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12 months

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State

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225-767-9148**Determination of Coefficient of Thermal Expansion Effects on Louisiana's PCC Pavement Design****PROBLEM**

The coefficient of thermal expansion (CTE) is a fundamental property of construction materials such as steel and concrete. Although the CTE of steel is a well-defined constant, the CTE of concrete varies substantially with aggregate type, mix design, and moisture condition.

The Mechanistic-Empirical Pavement Design Guide (MEPDG) demonstrates the importance of CTE in design and performance of Portland cement concrete (PCC) pavements. It is known that CTE has significant effects on slab cracking, curling and warping, joint faulting, and pavement smoothness. A better understanding of CTE effects on performance of Louisiana's PCC pavements is needed.

**OBJECTIVES**

After summarizing the current practice for measuring CTE of PCC, the researcher will determine the variance of CTE for concrete mixes used in Louisiana and provide recommendations for use of CTE in PCC pavement design. Additionally, the current specification for maximum spacing of transverse joints in jointed plain concrete pavement (JPCP) will be evaluated.

**METHODOLOGY**

A comprehensive search of recent studies on measuring the CTE of PCC will be performed, and current knowledge about the effects of concrete components on CTE will be summarized. Sensitivity of CTE to moisture condition will also be reviewed.

The MEPDG specifies using AASHTO TP-60, Standard Test Method for the Coefficient of Thermal Expansion of Hydraulic Cement Concrete, for measuring the CTE of PCC. The required test equipment will be obtained for experimental measurement of CTE for the Louisiana Department of Transportation and Development (LADOTD) PCC mixtures. Additionally, the effect of moisture condition on CTE will be monitored. A tabular summary of CTE measurements will be produced.

Using the CTE measurements, a case study will be conducted for comparison of field performance of existing pavements with predictors from the MEPDG. The study will examine how the CTE of PCC affects long-term pavement performance (cracking, faulting, and smoothness).

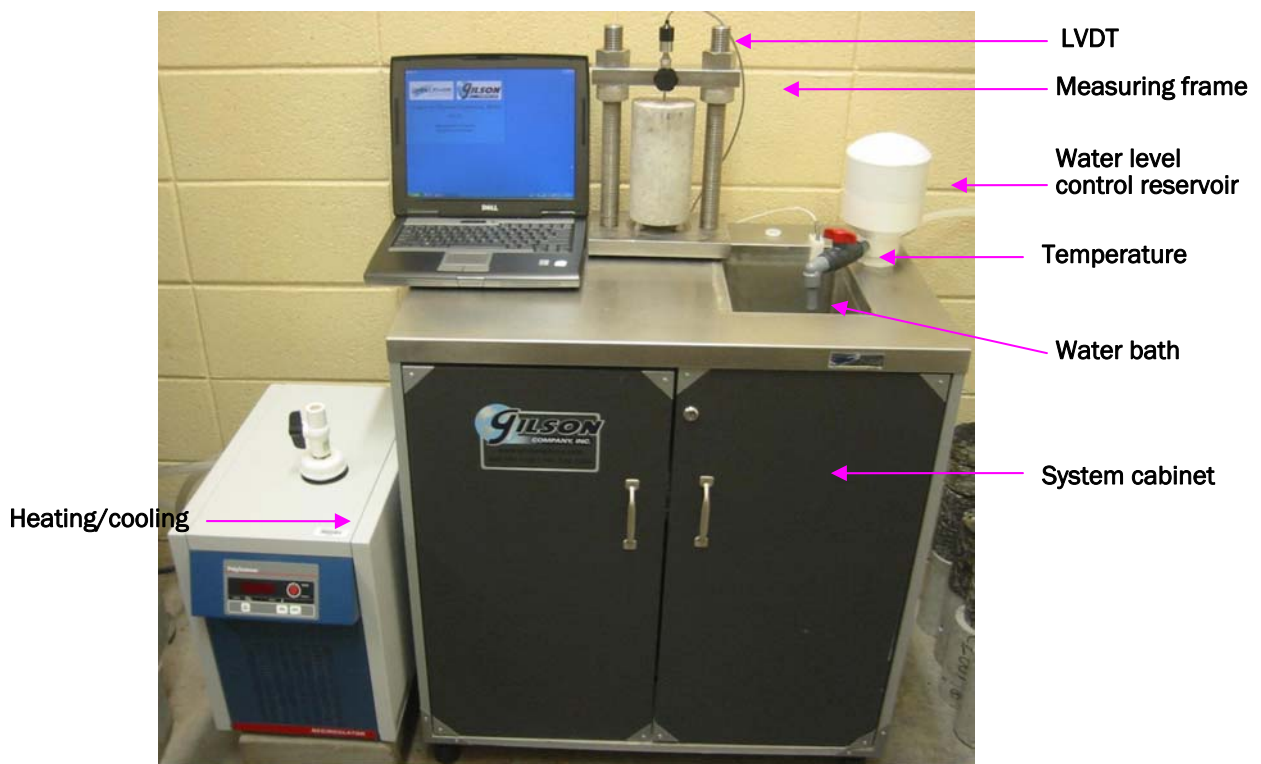
**SPECIAL POINTS OF INTEREST:**

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

The current specification for maximum spacing of transverse joints in JPCP is based on a uniform value of CTE and linear temperature gradient. Based on measurements obtained during this research, a recommendation for change is possible.

### **IMPLEMENTATION POTENTIAL**

Measured CTE values may be used as MEPDG input data for prediction of PCC pavement performance throughout its design life. Recommendations for LADOTD's use of CTE in PCC pavement design will be provided.



**Figure 1**  
**CTE Measuring Apparatus (HM-251)**

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