Research Project

05-1C

Capsule

Technology Transfer Program

LTRC

February 2006

Air Void Analyzer for Plastic Concrete

Start Date: *12/1/2005*
Duration: *18 months*
End Date: *5/31/2007*
Funding: *State*

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Problem

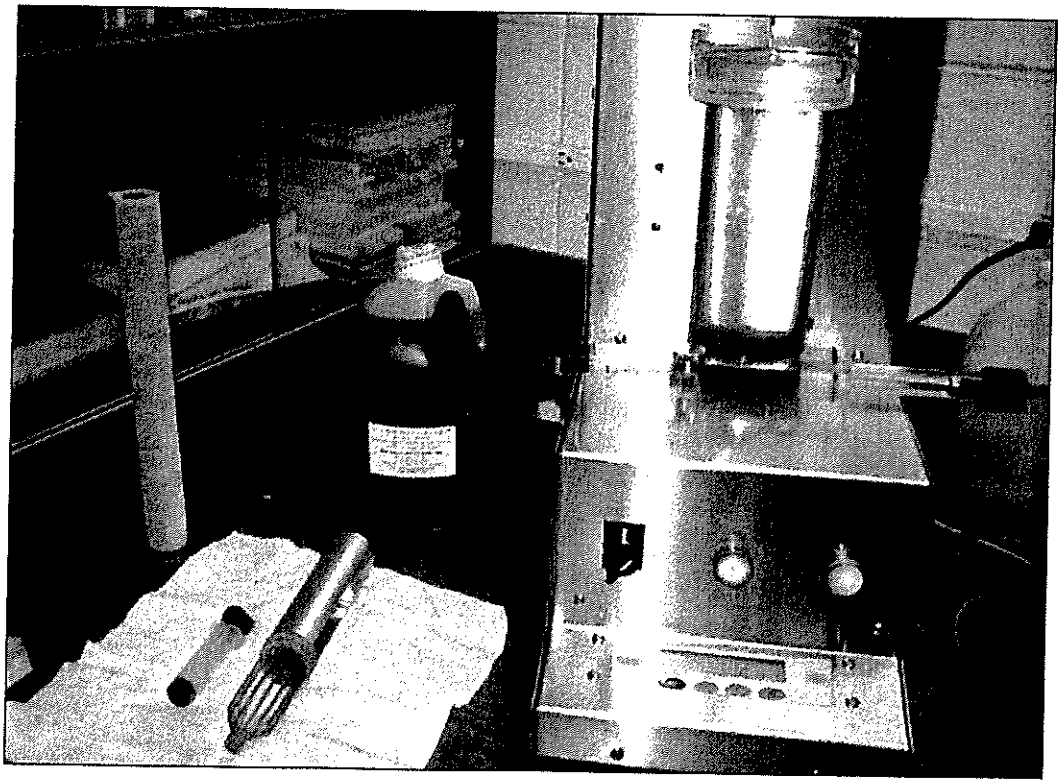
Various test methods, such as the pressure and volumetric (roll-a-meter) methods, are available for measuring the air content in plastic concrete. While these methods report the total air in the concrete, they can not distinguish between entrained air and entrapped air.

The ASTM C 457 method, Standard Test Method for Determination of the Parameters of the Air-Void System in Hardened Concrete, provides a more complete analysis of the content, distribution, and size of the air bubbles in the concrete matrix. However, this procedure requires analysis of a hardened concrete sample under the microscope, which is time consuming and expensive.

A new alternative, the Air Void Analyzer, has been developed to provide all this information about the air-void system of concrete in a more timely fashion than the alternative ASTM C457.

Objective

This study will correlate this new Air Void Analyzer technology with



The Air Void Analyzer during a test (right); the blue Air Void Analyzer liquid and the device used to collect the concrete sample (left)

established petrographic analysis. The findings will then be used to evaluate material and chemical admixture interactions in LADOTD's mixtures.

Description

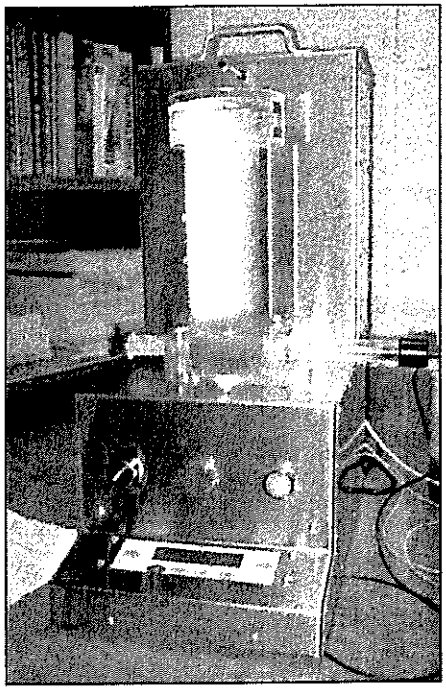
After a literature review, researchers will create trial batches to develop a structural class concrete mixture (Class AA). This mixture will serve as baseline from which other changes and adjustments will be made.

Next, structural mixtures will be made with varying dosages of air-entraining and water-reducing admixtures, gradations, and mixing times. Researchers will use the Air Void Analyzer to investigate the air-void system of all the mixtures and record their properties for later comparison.

Additional testing will include air content measurement using more traditional methods such as the pressure meter (ASTM C231) and roll-a-meter (ASTM C173). Cylinders will be prepared for each mixture to test the compressive strength of the concrete (ASTM C39) and perform the petrographic analysis of the air void system (ASTM C457). Beams will also be made to measure the different mixtures' resistances to freezing and thawing cycles. Results from the air content tests and the petrographic analysis will be compared to the Air Void Analyzer results.

Implementation Potential

The Air Void Analyzer can evaluate the air-void system properties of plastic concrete after it has been placed, thus providing a representative picture of concrete before it is set. This study should provide a better procedure for determining the properties of the air-void system of the in-place concrete, and LADOTD may use the findings to update the Standard Specifications and Testing Procedures regarding the testing of high-performance concrete. Updating these procedures will make acceptance testing more efficient and provide a more complete analysis of the concrete's air void system.



A concrete sample is tested in the Air Void Analzyer