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29 January 2007

Committee C09 on Concrete and Concrete Aggregates Subcommittee C09.23 on Admixtures

Research Report: C09-1032

Interlaboratory Study to Establish Precision Statements for: ASTM C 403/C 403 M, Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance

and

Proposed ASTM C WK2302- as of January 2007, Test Method for Determination of Setting Time of Concrete by the Temperature Method

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1. Introduction

An interlaboratory study was conducted to establish a precision statement for the current C 403/C 403 M, Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance and for a proposed Test Method for Determination of Setting Time of Concrete by the Temperature Method. The interlaboratory study (ILS) was organized by ASTM Section C09.23.01 and was conducted at the facilities of Construction Technology Laboratories (CTL) in Chicago on September 20-23, 2005. Five organizations participated by testing three concretes by both methods. This report documents the results of the interlaboratory study.

2. Test Method

The Test Method used for the first part of this ILS is C 403/C 403M-05. To obtain a copy of Test Method C 403/C 403M, go to ASTM's website, <u>www.astm.org</u>, or contact ASTM Customer Service by phone at 610-832-9585 (8:30 a.m. - 4:30 p.m. Eastern U.S. Standard Time, Monday through Friday) or by email at <u>service@astm.org</u>. The second part of the study was based on a proposed Test Method Test Method for Determination of Setting Time of Concrete by the Temperature Method, which is included as Attachment E.

3. Participating Laboratories

The following laboratories (and corresponding contact persons) participated in this interlaboratory study:

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4. Description of Samples

Three batches of ready-mixed concrete of varying targeted setting times were used for this study. The concrete mixtures were purchased from Meyer Material Co. Each concrete mixture was batched in four-cubic yard loads, and transported in a ready-mixed concrete truck to Construction Technology Laboratories (CTL). The concrete arrived approximately 20-30 minutes after batching. The mixture proportions slump, air content, unit weight, and temperature of the three mixtures are as follows:

	Mixture 1	Mixture 2	Mixture 2
Batch Time	7: 55 a.m.	8:44 a.m.	9:56 a.m.
Mix Category	"water	"control"	"accelerated"
	reduced"		
Mix Number	9015	9030	9030
Truck number	481	316	585
Yards batched	4	4	4
Cement, lb/yd ³	466	475	468
Fine Aggregate, $1b/yd^3$	1615 (6.8%	1568 (4.2%)	1575 (6.1%)
	moist.)		
Coarse Aggregate	1820 (0.5%)	1820 (0.5%)	1820 (0.5)
Water, lb/yd ³	130.1	197.8	164.5
Type A WR, oz/yd^3	21.75		
CaCl ₂ Solution, oz/yd^3			112
Slump, in	5 ¼	5	5 ¼
Unit weight, lb/ft ³	147.3	151.2	150.4
Air, %	2,4%	1.0%	1.3%
Temperature, °F	78	78	84.5

Table 1—Mixture Proportions and Fresh Properties

Mixture 2 was intended as a "control" mixture, Mixture 1 was intended to be representative of a low water-cement ratio concrete made with a water reducing admixture, and Mixture 3 contained calcium chloride as an accelerator.

5. Interlaboratory Study Instructions

Laboratory participants were e-mailed the test program instructions, which are included as Attachment A. Prior to the start of the actual testing of the concrete mixtures, each participating laboratory shipped the required equipment for each test method to CTL. On Tuesday, September 20, each team arrived at CTL and prepared their assigned work areas and equipment. A meeting was held to review the details of both test methods. On Wednesday, each team tested three truck loads of concrete by the current Test Method C 403/C 403M-05 and the proposed new test method based temperature measurements.

Upon arrival of the concrete at CTL, approximately one cubic yard of concrete was discharged into a dumpster. Then, each team received a wheelbarrow of concrete to make three specimens each for the Test Method C 403/C 403M penetration test and the new proposed method based on

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