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

**Research Report: C09-1052** 

# Interlaboratory Study to Establish Precision Statements for ASTM C0403/C0403M-16, Test Method For Time of Setting of Concrete Mixtures by Penetration Resistance

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# 1. Introduction:

Interlaboratory Study 29 was conducted to establish a precision statement for C0403/C0403M, Test Method For Time of Setting of Concrete Mixtures by Penetration Resistance.

# 2. Test Method:

The Test Method used for this ILS is ASTM C403/403M – 08. To obtain a copy of C0403, 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>.

# 3. Participating Laboratories:

The following laboratories participated in this interlaboratory study:

Anton Shindler Auburn University 238 Harbert Eng. Center Auburn, AL 36849-5337

Rachael Barbour BASF Corporation Admixture Systems 23700 Chagrin Blvd Beachwood, OH 44122

Jeff Abbuhl Euclid Chemical 19218 Redwood Road Cleveland, OH 44110

Gary Knight Heidelberg Cement Group 6555 Button Gwinnett Dr. Doraville, GA 30340

Tim Cost Holcim (US) Inc., 121 Hampton Hills Blvd. Canton, MS 39046 Mark Niemuth Lafarge 810 Crescent Centre Drive Franklin, TN 37067

Lehigh Hanson, Inc. 300 E. John Carpenter Freeway Irving, TX 75062

Ana Jimenez Sika Corporation 201 Polito Avenue Lyndhurst, NJ 07071

Shawn McCormick TEC Services 235 Buford Dr Lawrenceville, GA 30046

Paul Sandberg W.R. Grace 6 Dow Ave Arlington, MA 02476

#### 4. **Description of Samples:**

There were 3 concrete mixtures of varying targeted results used for this study. Concrete was batched and supplied by Thomas Concrete. Below is a list of the samples:

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Constituent	Mix Identification		
	1	2	3
Water, kg/m <sup>3</sup>	173	178	178
Type I Portland Cement, kg/m <sup>3</sup>	-	362	279
Type I Portland Cement, kg/m <sup>3</sup>	362	-	-
Class F Fly Ash, kg/m <sup>3</sup>	-	-	71
No. 57 Stone, kg/m <sup>3</sup>	1083	1083	1055
Natural Sand, kg/m <sup>3</sup>	310	306	311
Washed Grey Sand, kg/m <sup>3</sup>	482	474	484
Water-reducing/Retarding Admixture, mL/m <sup>3</sup>	-	471	182
Mid-range Water-reducing Admixture, mL/m <sup>3</sup>	471	-	-
Water-to-Cementitious-Materials Ratio (w/cm)	0.48	0.49	0.51

# 5. Interlaboratory Study Instructions

Laboratory participants were emailed the test program instructions. For a copy of the instructions, please see Annex A.

#### 6. Description of Equipment/Apparatus<sup>1</sup>:

For information on the equipment/apparatus used by each laboratory, please see Annex B.

# 7. Data Report Forms:

Each laboratory was provided with a data report form for the collection of data. A copy of the data is provided in Annex C.

Please note: The laboratories have been randomly coded and cannot be identified herein.

#### 8. Statistical Data Summary:

A summary of the statistics calculated from the data returned by the participating laboratories is provided in Annex C.

#### 9. Precision and Bias Statement:

#### 9.1 Precision

NOTE 7—The precision values were obtained from an interlaboratory study involving 10 laboratories and three concrete mixtures. The range of the average time of initial setting was from 230 to 470 minutes, and the range of the average time of final setting was from 310-to 580 minutes. Two replicate determinations were made by each operator on specimens made from each mixture. Setting times were determined by regression analysis as described in X1.3. Data were obtained using apparatus described by the inch-pound version of this test method.

9.1.1 *Single-Operator Precision*—The single-operator coefficients of variation are shown in Table 1.A The results of two properly conducted tests by the same operator on the same material are not expected to differ by more than the values shown in the third column of Table 1, as a percentage of their average.A For three

<sup>&</sup>lt;sup>1</sup> The equipment listed was used to develop a precision statement for C0403/C0403M-16. This listing is not an endorsement or certification by ASTM International.

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