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# Committee G01 on Corrosion of Metals Subcommittee G01.14 on Corrosion of Metals in Construction Materials

# **Research Report: G01-1027**

# Interlaboratory Study to Establish Precision Statements for ASTM C876-15, Test Method for Corrosion Potentials of Uncoated Reinforcing Steel in Concrete

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## **1.** Introduction:

An Interlaboratory Study was conducted to establish a precision statement for C876, Test Method for Corrosion Potentials of Uncoated Reinforcing Steel in Concrete.

## 2. Test Method:

The Test Method used for this ILS is C876-15. To obtain a copy of C876, 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:

Laboratory Contact Information was unavailable at the time of the publication of this report.

## 4. Description of Samples:

Five concrete slabs with embedded steel rods were each measured at 12 points in a 3 by 4 grid pattern was used for this study. Contact information on the supplier and preparer of the samples was unavailable at the time of publication of this report.

#### 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.

<u>Please note:</u> 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:

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<sup>&</sup>lt;sup>1</sup> The equipment listed was used to develop a precision statement for C876-15. This listing is not an endorsement or certification by ASTM International.

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9.1 Precision—Precision is the closeness of agreement between the test results obtained under prescribed conditions. In the discussion below two types of precision are discussed: repeatability and reproducibility. Repeatability is within laboratory variability when the same operator uses the same equipment on identical specimens in sequential runs. Reproducibility is the variability that occurs when identical specimens are run in different laboratories.

9.1.1 The precision of ASTM C0876 Standard Test Method for Corrosion Potential of Uncoated Reinforcing Steel in Concrete was evaluated by means of an interlaboratory test program in which the corrosion potential of five slabs of concrete with embedded steel rods were each measured at twelve points in a three by four grid pattern. Six laboratories collected data using the saturated copper/copper sulfate reference electrode. In addition, four laboratories also used the saturated KCl silver/silver chloride reference electrode with the same procedure. The results of this program were analyzed according to the ASTM E691 procedure.

9.1.2 Repeatability: The repeatability standard deviations for each slab using the copper/copper sulfate reference electrode are shown in Table 1. The repeatability standard deviations for these slabs using the KCl saturated silver/silver chloride reference electrode are shown in Table 2. The variations are not significantly different so a pooled repeatability standard deviation was calculated representing the result for the program of 15.9 mV. The repeatability limit for the program was also calculated as 2.8 sr , 45 mV.

9.1.3 Reproducibility: The reproducibility standard deviations for each slab using the copper/copper sulfate reference electrode are shown in Table 1. The reproducibility standard deviations for these slabs using the saturated KCl silver/silver chloride reference electrode are shown in Table 2. The variations were not significantly different so a pooled standard deviation was calculated representing the result of this program of 20 mV. The reproducibility limit for the program was also calculated as 2.8 sR, 57 mV.

Note 1—The saturated KCl silver/silver chloride reference electrode has a standard potential of +196 mV versus the SHE while the saturated copper /copper sulfate electrode has a standard potential of +300 mV (ASTM G003, Table X2.1). The average potential difference between the copper/copper sulfate reference electrode and silver/silver chloride reference electrode was 128 mV in this study rather than 104mV as predicted by ASTM G003. The reason for this difference was not determined.

9.2 Bias—There is no bias in the potentials measured by this method because the potentials measurements are defined only in terms of this method.

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