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29 March 1993

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

Research Report C09-1005

**Interlaboratory Study to Establish Precision Statements for ASTM
C233, Test for Testing Air-Entraining Admixtures for Concrete**

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REPLY TO
ATTENTION OF

June 1, 1990

Structures Laboratory
Cement and Pozzolan Group

Mr. Ara A. Jeknavorian
W.R. Grace
62 Whittemore Ave.
Cambridge, MA

Research Report
C233, Item 4 C9(92-2)

Dear Ara:

Enclosed are the analyses of the interlaboratory studies on total solids and specific gravity of air entraining admixtures for use in developing precision estimates. You will see in the accompanying notes that there were some instances in which ASTM C 802 was not strictly adhered to. Some of these things must, I believe, involve some judgment and so I made some decisions about whether or not to exclude data, or whether or not to combine estimates of precision based on what I considered to be reasonable judgments. People more familiar with these materials and test methods may take issue with some of these decisions, so that the calculations may need to be done over. This would be no problem since they are all computerized. Let me know.

Sincerely,

Toy S. Poole
Toy S. Poole

Enclosures

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Notes on Analysis of Interlaboratory Data on Measurement of Specific Gravity in Air Entraining Admixtures for Use in Estimating Within- and Between-Laboratory Precision

Toy S. Poole¹

Ten laboratories submitted data on specific gravity for four air entraining admixtures. All labs, except one, submitted data in triplicate. Data are summarized in Table 1. Two labs used a pycnometer (#'s 2 and 7) and eight labs used a hydrometer for determinations. The mean results from these two equipment groups were significantly different at the 5% probability level when data were analysed by analysis of variance ($\bar{x}_{\text{pyc}}=1.024$, $\bar{x}_{\text{hyd}}=1.022$). This difference is relatively small and may not necessarily be due to equipment differences, but could be a reflection of differences in practice between the two groups. Since the difference was small, this effect was ignored in precision estimates.

Data were analysed according to ASTM C 802-87, "Standard Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction Materials," with some deviations, as noted below. Paragraphs 8.2 and 8.3 are specifically applicable.

Before calculating within- and between-laboratory variances, C 802 directs that the data should be examined to insure homogeneity of variances among laboratories and to insure that the pattern of results among laboratories is similar (laboratory-material interaction).

Homogeneity of Variance

C 802 first directs that the within-laboratory variances be examined for evidence that some data are too variable. No evidence of this was found.

C 802 then directs that within-laboratory variances be compared to determine whether any laboratories reported results that are too uniform. This would indicate that perhaps these laboratories did not conduct the tests in such a way as to allow all of the potential sources of within-laboratory error to come to bear. This sometimes occurs when all replicates are conducted simultaneously or in close succession, so that sources of error that might appear in performing the tests on separate days do not appear. Thirteen of forty sets of results showed zero variation. Paragraph 8.2 of C 802 recommends deleting these results. I did not follow that recommendation in this case for the following reasons: a) these results did not come from a consistent subset of laboratories (which would have suggested that such a subset had done something wrong); and b) examination of other reported results indicates that the precision of this test method is very high, so that it is plausible that several sets of triplicate results could occur with a zero variance.

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