



Standard Practice for Conducting A Ruggedness or Screening Program for Test Methods for Construction Materials¹

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1. Scope

1.1 This practice covers a procedure for detecting sources of variation in a test method. The procedure should be used during the development of a test method, before the interlaboratory study is executed, such as those in Practices C 670, C 802, and E 691. Interlaboratory studies can be expensive to execute. Resources will probably be more efficiently used if sources of variation in a test method are eliminated prior to performing the interlaboratory study. The procedure also is useful for determining sources of variation in an existing test method that has been found to have poor precision.

1.2 This practice covers, in very general terms, techniques for planning, collecting data, and analyzing results from a few laboratories. Annex A1 provides the details of the procedure with an example and Annex A2 gives the theoretical background.

1.3 The practice does not give information pertinent to estimating within- or between-laboratory precision.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials²

C 802 Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction Materials²

E 456 Terminology Relating to Quality and Statistics³

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method³

E 1169 Guide for Conducting Ruggedness Tests³

3. Terminology

3.1 Definitions:

3.1.1 *determination value, n*—numerical quantity calculated as directed in the test method using direct measurements obtained in accordance with the procedures given in the test method.

3.1.2 *replication, n*—the act of obtaining two or more determination values under specified conditions. The number of replications must be finite and the scope of the replication operation may be narrow or broad, but must be specified.

3.1.3 For definitions of other statistical terms used in this standard, refer to Terminology E 456.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *factor, n*—an element in the test procedure or laboratory environment that is a potential source of variation in test results.

3.2.2 *ruggedness, adj*—the characteristic of a test method that produces test results that are not influenced by small differences in the testing procedure or environment.

3.2.3 *screening, n*—the detection of significant sources of variation as compared to chance variation.

3.2.4 *variable, n*—a number or quantity that varies.

4. Summary of Practice

4.1 The practice requires that the user develop, from theoretical or practical knowledge, or both, a list of factors that plausibly would cause significant variation in test results if the factors were not controlled. The technique is limited to the analysis of the effects seven factors and requires considerably less effort than would be required to collected data for seven factors in a full factorial study. Procedures exist for analysis of smaller and larger numbers of factors (see Guide E 1169), but seven is a convenient number for many test methods for construction materials. The seven-factor analysis requires 16 determinations by each laboratory. The procedure can be usefully executed by a single laboratory, but sometimes additional information can be obtained if it is repeated in one or two additional laboratories.

¹ This practice is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates. This practice was developed jointly by ASTM Committees C-1, C-9, D-4, and D-18, and is endorsed by all four committees.

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² Annual Book of ASTM Standards, Vol 04.02.

³ Annual Book of ASTM Standards, Vol 14.02.