



Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory¹

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1. Scope

1.1 This test method determines the amount of expansion and accumulation of bleed water at the surface of freshly mixed hydraulic-cement grout used in the production of preplaced-aggregate (PA) concrete.

1.2 It is for use with cement grout whether or not it includes fine aggregate or mineral admixtures or both.

1.3 The values stated in SI units are to be regarded as standard.

1.4 *This standard may involve hazardous materials, operations, and equipment. 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 125 Terminology Relating to Concrete and Concrete Aggregates²

C 937 Specification for Grout Fluidifier for Preplaced-Aggregate Concrete²

3. Terminology

3.1 *Definition of Terms*—Terms used in this test method are defined in Terminology C 125 or in this section.

3.1.1 *expansion*—increase in the volume of a grout, expressed as a percentage of the original volume of the grout.

3.1.2 *bleeding*—This term is defined as stated in Terminology C 125, with the exception that it pertains to grout in this test method.

4. Summary of Test Method

4.1 Grout is placed in a graduated cylinder. Changes in total volume and accumulation of bleed water, if any, on the surface of the grout are observed over a period of time.

¹ This test method is under the jurisdiction of ASTM Committee C-9 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.41 on Concrete for Radiation Shielding.

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² *Annual Book of ASTM Standards*, Vol 04.02.

5. Significance and Use

5.1 This method is useful for determining the expansion and bleeding characteristics of freshly mixed fluid grout used in PA concrete.

6. Interferences

6.1 Failure to obtain a uniformly smooth mixture, free of lumps, will cause excessive bleeding and may result in reduced expansion.

6.2 The capability of most admixtures to produce expansion and the tendency to bleed is related to the temperature of the grout during the period of test.

7. Apparatus

7.1 *Glass Graduate*, 1000 mL, reading to 10 mL.

7.2 *Glass Graduate*, 25 mL, reading to 1 mL.

7.3 *Thermometer*, accurate to 0.5°C (1°F) for measuring grout and air temperature.

8. Test Sample

8.1 The grout test sample shall consist of approximately 1500 mL and shall be representative of the grout in the mixer.

9. Procedure

9.1 When sampling and testing are being performed in the laboratory for the purpose of designing or comparing mixtures or for qualifying admixtures including grout fluidifiers proceed in the following manner:

9.1.1 Maintain the ambient temperature of the room in which the test is performed at $23.0 \pm 2^\circ\text{C}$ ($73.4 \pm 3^\circ\text{F}$), unless otherwise specified.

9.1.2 Bring the temperature of all dry materials and mixing water to a constant temperature of $23.0 \pm 2^\circ\text{C}$ ($73.4 \pm 3^\circ\text{F}$) before mixing, unless otherwise specified.

9.1.3 Start volume measurements within 3 min of completion of mixing.

9.2 When sampling and testing are being performed in the field, record the temperature of the grout sample and the ambient temperature of the area in which the test readings are made. Record the time interval between completion of mixing and start of test.

9.3 Immediately after the completion of mixing, measure the temperature of the grout. Then introduce the grout into a

 **C 940**

1000-mL graduated cylinder until the volume of the sample is 800 ± 10 mL. Record the volume of the sample and the time at which the reading was made. Place the graduated cylinder on a level surface free of vibration. Cover to prevent evaporation of the bleed water.

9.4 Take and record the readings, estimated to the nearest 1 mL, of the upper surfaces of the grout and bleed water, if any, of the sample in the graduate at 15-min intervals for the first 60 min and thereafter at hourly intervals until two successive readings show no further expansion or bleeding. When the test for expansion and bleeding is used in connection with Specification C 937, it shall be discontinued 3 h after the initial reading.

9.5 At the conclusion of the test, decant the bleed water into a 25-mL graduate by tilting the specimen and drawing the water off with a pipet or large medicine dropper. Record the final volume of bleed water to the nearest 0.5 mL.

10. Calculation

10.1 Calculate the expansion of the grout, and its bleeding and the combined expansion of grout plus bleed water as percentages of the initial volume of the grout, as follows:

$$\text{Expansion, \%} = \frac{V_g - V_1}{V_1} \times 100$$

$$\text{Bleeding, \%} = \frac{V_2 - V_g}{V_1} \times 100 \text{ at prescribed intervals}$$

$$\text{Combined Expansion, \%} = \frac{V_2 - V_1}{V_1} \times 100$$

$$\text{Final bleeding, \%} = \frac{V_w}{V_1} \times 100$$

where:

V_1 = volume of sample at beginning of test, mL,

V_2 = volume of sample at prescribed intervals, measured at upper surface of water layer, mL,

V_g = volume of grout portion of sample at prescribed intervals, at upper surface of grout, mL, and

V_w = volume of decanted bleed water, mL.

11. Report

11.1 The report shall include the following:

11.1.1 Identification of the grout sample.

11.1.2 Expansion of grout to the nearest 0.2 % for each prescribed interval.

11.1.3 Bleeding of grout to the nearest 0.2 % for each prescribed interval.

11.1.4 Combined expansion of grout plus bleed water to the nearest 0.2 % for each prescribed interval.

11.1.5 Final bleeding to nearest 0.2 %.

11.1.6 Temperature of grout sample at start of test.

11.1.7 Ambient temperature of laboratory or testing area at the beginning and end of test.

12. Precision and Bias

12.1 *Precision:*

12.1.1 *Bleeding*—The single laboratory, three operators, standard deviation has been found to be 0.06 %. Therefore, results from two properly conducted tests (by the same operator) on the same material should not differ by more than 0.17 %.

12.1.2 *Combined Expansion*—The single laboratory, three operators, standard deviation has been found to be 0.37 %. Therefore, results from two properly conducted tests (by the same operator) on the same material should not differ by more than 1.04 %.

12.2 *Bias*—No statements on bias can be prepared because there are no standard reference materials.

13. Keywords

13.1 bleeding; concrete; expansion; grouts; preplaced-aggregate; preplaced-aggregate concrete

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