Designation: C1741 – 12

Standard Test Method for Bleed Stability of Cementitious Post-Tensioning Tendon Grout[1]

This standard is issued under the fixed designation C1741; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method is designed to determine the bleed stability of freshly-mixed cementitious grout under static pressure.

1.2 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *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.*(**Warning—**Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.[2])

2. Referenced Documents

2.1 *ASTM Standards:*[3]

C125 Terminology Relating to Concrete and Concrete Aggregates

C938 Practice for Proportioning Grout Mixtures for Preplaced-Aggregate Concrete

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology C125.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *bleed stability, n—of cementitious grout,* resistance to bleeding.

3.2.2 *bleeding, n—of cementitious post-tensioning tendon grout,* autogenous flow of mixing water within, or its emergence from, newly placed grout; caused by the settlement of the solid materials within the grout and the filtering action of strands and wires when subjected to static pressure and capillary action.

3.2.3 *grout, n*—mixture of cementitious material and water, with or without aggregate and admixtures, proportioned to produce a pourable consistency without segregation of the constituents.

3.2.4 *post-tensioning, adj*—referring to a method of prestressing in which prestressing steel is tensioned after the concrete has gained sufficient strength.

4. Significance and Use

4.1 This test method is designed to evaluate the bleed stability of a freshly-mixed grout under static pressure. It can be used in both the laboratory to qualify grout materials and in the field as a quality control test. When used to qualify grout materials, replicate tests may be specified. It is intended that the test pressure, acceptance criteria, and number of replicate tests be set forth in the contract documents if this test method is referenced. These values will normally vary depending on the vertical rise of the post-tensioning tendon.

NOTE 1—Appendix X1 includes a reference for an example of test pressures and bleeding limits.

4.2 The procedure for this test was developed by Schokker et al.[4] based on previous work by Schupack.[5]

5. Apparatus

5.1 The apparatus consists of a commercially available pressure filtration funnel, stand, pressure supply with gauge, pressure regulator, valve, drip wick, and bleed water collection container as shown in Fig. 1 and Fig. 2.

5.1.1 *Filtration Funnel*—A 47-mm diameter stainless steel pressure filtration funnel with a nominal capacity of 200 mL as shown in Fig. 2. The filtration funnel shall have removable threaded caps at both ends with a stem for connection of the

[1] This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.41 on Hydraulic Cement Grouts.

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[2] Section on Safety Precautions, *Manual of Aggregate and Concrete Testing*, *Annual Book of ASTM Standards*, Vol 04.02.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[4] Schokker, A. J., Koester, B. D., Breen, J. E., and Kreger, M. E., "Development of High Performance Grouts for Bonded Post- Tensioned Structures," Research Report 1405-2, Center for Transportation Research, October 1999.

[5] Schupack, M. "Admixture for Controlling Bleed in Cement Grout Used in Post-Tensioning,"*Precast/Prestressed Concrete Institute Journal*, Nov.–Dec. 1974, pp. 1–10.

FIG. 1 Test Apparatus

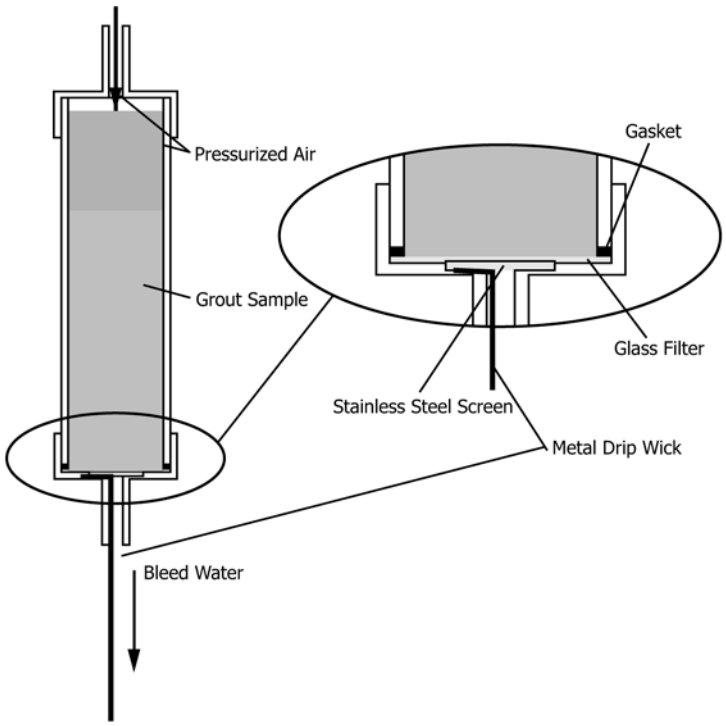

FIG. 2 47-mm Filtration Funnel with 200 mL Nominal Capacity

gas supply and a 7.0 ± 0.5 mm inside diameter stem 90 ± 1 mm long for escape of water. The base of the vessel shall contain a 35 ± 1 mm diameter stainless steel 45 µm (No. 325) screen that supports a 47 mm diameter Type A/E borosilicate glass filter (1-µm pore size) as shown in Fig. 2. The screen shall be inserted with the woven side against the glass filter, and the funnel gasket shall be placed above the glass filter as shown in Fig. 2. The glass filter shall cover the screen across the inside

diameter of the bottom cap and be located under the gasket when under pressure. Secure the bottom cap before filling the filtration funnel with grout. The funnel is placed in the stand after it is filled.

5.1.2 *Stand*—The filtration funnel shall be attached to a stand capable of holding the funnel in the vertical position with adequate space for the bleed water collection container. The bottom stem of the filtration funnel shall be inserted into the bleed water collection container.

5.1.3 *Gas Supply*—An air or other inert gas pressure supply with a pressure regulator, an in-line shutoff valve, and pressure gauge shall be firmly attached to the top stem of the filtration funnel. The pressure gauge shall be capable of reading pressures up to 700 kPa with 20 kPa graduation marks.

5.1.4 *Metal Drip Wick*—A metal paper clip or suitable thin metal wire or rod shall be bent to direct the water squeezed out of the filtration funnel into the collection vessel.

NOTE 2—A wire of approximately 1 mm diameter has been found satisfactory for the drip wick.

5.1.5 *Bleed Water Collection Container*—The bleed water collection container shall consist of a 10-mL transparent graduated cylinder with 0.2-mL graduation marks.

6. Sample Preparation

6.1 Grout shall be mixed in accordance with the manufacturer's instructions or in accordance with Practice C938 if no other instructions are provided. For field quality control testing, the grout shall be mixed using the same equipment and procedure as used for the installation of the material.

7. Procedure

7.1 Fill the filtration funnel with freshly-mixed grout within 5 min after completion of grout mixing.

7.2 Screw the top stem cap on the funnel hand tight while keeping the funnel in an upright position.

7.3 Place the funnel in the stand.

7.4 Connect the gas supply (gas pressure at 0 kPa).

7.5 Allow grout to rest in the funnel for 10 min (±30 s) after grout placement.

7.6 Increase pressure to the specified pressure level (±20 kPa) within 30 s.

7.7 Hold at the specified pressure for 5 min (±5 s) unless a longer time is specified.

NOTE 3—This test can be kept at the designated pressure beyond 5 min to confirm the long term bleed stability of the grout and this deviation should be noted in the report.

7.8 Release the pressure and tip the filtration funnel slightly to break the surface tension and allow the bleed water remaining in the exit stem to be collected as part of the bleed volume to be measured.

7.9 Measure the volume of the collected bleed water to the nearest 0.2 mL at the end of the hold time.

7.10 If a complete loss of pressure occurs before completion of the 5-min hold period, the test is considered invalid for the specified pressure level.

NOTE 4—Loss of pressure in this test generally occurs as a "blowout" or complete loss of pressure with gas blowing out of the stem.

8. Report

8.1 Report the bleed volume as a percentage of the nominal sample volume as follows:

$$\%\ Bleeding = \frac{bleed\ (mL)}{200\ mL} \times 100 \quad (1)$$

8.2 Report the pressure used for the test and the duration for which the pressure was applied.

8.3 If replicate tests are specified, report each test result individually.

9. Precision and Bias

9.1 *Precision*—The standard deviation obtained by one operator has been determined to be 0.03 % bleeding by volume based on three replicate tests at 140 kPa for a grout with an average bleeding of 1.6 % by volume. For a grout tested at 220 kPa with an average bleeding of 0.6 % by volume, the standard deviation obtained by one operator has been determined to be 0.17 % based on three replicate tests.

NOTE 5—An interlaboratory study will be conducted and a complete precision statement will be available by 2015.

9.2 *Bias*—No statement on bias is being made because there is no accepted reference material suitable for determining the bias in this test method.

10. Keywords

10.1 bleed stability; bleed water; bleeding; grout; post-tensioning; pressure

APPENDIX

(Nonmandatory Information)

X1. REFERENCE FOR SPECIFICATION LIMITS FOR PRESSURIZED BLEED TEST

X1.1 When tested using the pressurized bleed test, the maximum percentage of permitted bleeding in grout should be specified in contract documents. Normally, the specification requirements for test pressure and maximum percentage bleeding will differ depending on the vertical rise of the post-tensioning tendons being used.

X1.2 The bleed limits for the test pressures based on work by Hamilton, Schokker, and Schupack[6] should result in grout with little or no bleeding for the given vertical rise. These bleed limits apply to the grout sample tested in accordance with this test method for a duration of 5 min of applied pressure and do not represent the permitted amount of bleeding when the grout mixture is used in the actual structure.

[6] Hamilton, H. R., Schokker, A. J., and Schupack, M., "Estimating Post-Tensioning Grout Bleed Resistance Using a Pressure- Filter Test," *Precast/Prestressed Concrete Institute Journal*, March–April 2002, pp. 32–39.