Section 1  
Overview


This test method covers two procedures, used both in the laboratory and in the field, for determining the time of efflux of a specified volume of fluid hydraulic cement grout through a standardized flow cone.

Method 1

Use this method with neat grout, grouts containing fine aggregate all passing a 2.36 mm (No. 8) sieve, and grout having an efflux time of 35 sec. or less.

Except for editorial differences, this procedure is identical to ASTM C 939.

Method 2

Use this method for thixotropic grouts with a required efflux time of:

♦ 9 to 20 sec. immediately after mixing and

♦ 30 sec. maximum with 30 min. standing time after initial mixing and remixed for 30 sec. before testing.

Method 2 is a modified version of ASTM C 939.

Units of Measurement

The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.
Section 2

Apparatus

The following apparatus is required:

♦ flow cone, with dimensions as shown in 'Flow Cone.' The body and discharge tube may be stainless steel, case aluminum, or other essentially noncorroding material

♦ receiving container, with a minimum capacity of 2000 mL

♦ receiving container, with a minimum capacity of 1000 mL and with a calibration mark at 1000 mL

♦ ring stand, or other device, capable of supporting the flow cone in a vertical, steady position over the receiving container

♦ level, carpenter's or similar

♦ stopwatch, least reading of not more than 0.2 sec.

♦ grout mixer.

Figure 1. Flow Cone.
Section 3

Calibrating Apparatus

Perform calibration of the test apparatus as follows:

♦ Mount the flow cone, free from vibration, with the top level.
♦ Close the outlet of the discharge tube with a finger or a stopper.
♦ Introduce 1725 ±5 mL of water into the cone.
♦ Adjust the point gage to indicate the level of the water surface.
♦ Allow the water to drain.

Before first use of the flow cone with grout and periodically thereafter, check the accuracy of the cone by filling it with water as described above.

♦ After checking or adjusting the point gauge, start the stopwatch and simultaneously remove the finger.
♦ Stop the watch at the first break in the continuous flow of water.
♦ The time indicated by the stopwatch is the time of efflux of water.
♦ If this time is 8.0 ±0.2 sec., the cone may be used for determining the time of efflux of grout.
Section 4

Method 1

Preparing Sample

Use a test sample of at least 1725 mL and representative of the grout in the mixer. When sampling and testing for the purpose of proportioning or comparing mixes or for qualifying materials, the temperature of the dry materials and mixing water should be such that the temperature of the freshly-mixed grout is 23 ±1.7°C (73.4 ±3°F), unless otherwise specified.

NOTE: The presence of solid particles retained on the 2.36 mm (No. 8) sieve or lumps of unmixed material in the grout may cause the grout to flow unevenly through the discharge tube of the flow cone or stop the flow completely. Uneven flow will result in slower transit of the grout, thereby indicating a false consistency.

Test Procedure

The steps below describe the testing procedure for Method 1.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
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| **1** | ♦ Moisten the inside of the flow cone by filling the cone with water. One min. before introducing the grout sample, allow the water to drain from the cone.  
♦ Close the outlet of the discharge tube with a finger or a stopper. |
| **2** | ♦ Introduce the grout into the cone until the grout surface rises to contact the point gauge.  
♦ Start the stopwatch, and simultaneously remove the finger or stopper. |
| **3** | ♦ Stop the watch at the first break in the continuous flow of grout from the discharge tube, and then look into the cone.  
♦ If light is visible through the discharge tube, the time indicated by the stopwatch is the time of efflux of the grout.  
♦ If light is not visible, the flow cone test is not applicable for grout of this consistency.  
♦ For a valid result, conduct at least 2 tests having times of efflux within 1.8 sec. of their average.  
♦ Conduct time of efflux tests within 1 min. of drawing of the grout from the mixer or transmission line.  
♦ When grout is being placed over a significant period of time, determine the time of efflux at selected intervals to demonstrate that the consistency is suitable for the work. |
Section 5
Method 2

Preparing Sample

Use a test sample of at least 4600 mL and representative of the grout in the mixer. When sampling and testing for the purpose of proportioning or comparing mixes or for qualifying materials, the temperature of the dry materials and mixing water should be such that the temperature of the freshly-mixed grout is 23 ±1.7°C (73.4 ±3°F), unless otherwise specified.

Test Procedure

The steps below describe the testing procedure for Method 2.

<table>
<thead>
<tr>
<th>Method 2</th>
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<tbody>
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<td><strong>Step</strong></td>
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| 1 | ♦ Moisten the inside of the flow cone by filling the cone with water. One min. before introducing the grout sample, allow the water to drain from the cone.  
♦ Close the outlet of the discharge tube with a finger or a stopper. |
| 2 | ♦ Introduce the grout, immediately after mixing, into the cone until the grout reaches the top surface of the cone.  
♦ Start the stopwatch and simultaneously remove the finger or stopper. |
| 3 | ♦ Stop the watch when the receiving container is filled to the 1000 mL calibration mark.  
♦ The time indicated by the stopwatch is the grout efflux time.  
♦ The efflux time of the grout immediately after mixing will be between 9 and 20 sec. for 1000 mL discharge. If it is not between 9 and 20 sec., then retest. |
| 4 | ♦ Let the grout stand for 30 min. without further agitation. Remix for 30 sec. and perform Steps 1 through 3 again on this sample.  
♦ The test time of efflux will not be more than 30 sec. for 1000 mL discharge. |
Section 6

Report

Include the following in the report:

♦ identification of the sample

♦ identification of materials in the sample, the proportions, and whether the tested sample represents laboratory-prepared or field-production mix

♦ average time of efflux to the nearest 0.2 sec. and the time interval from sampling to testing

♦ ambient temperature and sample temperature at the time of test.
Section 7

Archived Versions

Archived versions of "Tex-437-A, Test for Flow of Grout Mixtures (Flow Cone Method)" are available through the following links:

◆ Click on 437-0899 for the test procedure effective August 1999 through November 2004.