Scope

1. This method of test covers the procedure to be used for determining the flow of grout mixtures by measuring the time of efflux of a specified volume of grout through a standard flow cone. The test shall be conducted on slurry mixtures to determine grout consistency and to insure uniformity of batches.

Apparatus

2. (a) *Flow Cone* - A flow cone constructed of cast aluminum of sufficient size to hold amount of slurry required for each test and conforming to the dimensions shown in Figure 1.

(b) *Stopwatch* - A stopwatch having a least reading of not more than 0.1 second.

(c) *Thermometer* - A thermometer with a range of 32° F - 130° F (0°C - 54.4°C), graduated in one degree increments.

(d) *Containers* - Two containers of sufficient size to collect grout sample and to be used for cleaning the flow cone.

(e) *Ladle*

(f) *Graduated Cylinder*

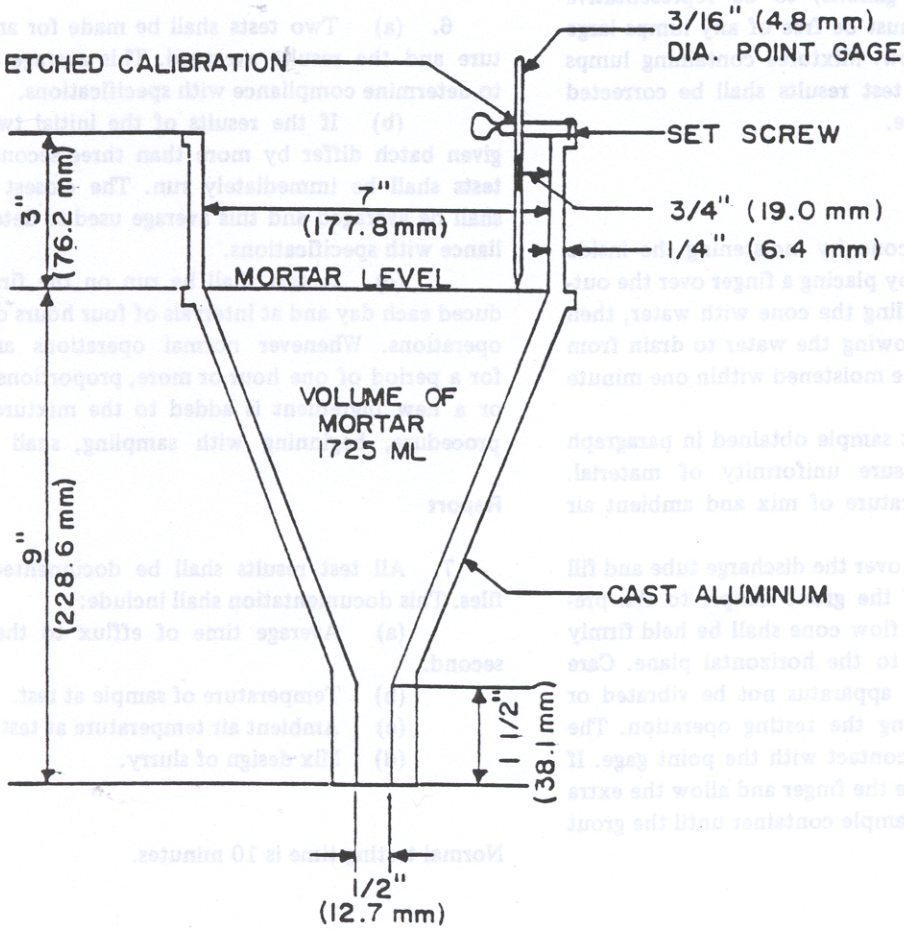

Figure 1

Calibration of Apparatus

3. The flow cone shall be held firmly so that the top is parallel to the horizontal plane. Care must be exercised that the apparatus not be vibrated or moved in any manner during the calibration operation. The discharge tube shall be closed by placing a finger over the lower end. A quantity of water (1725 $\pm$ 1 ml) shall be introduced into the cone. The point gage shall then be adjusted so that it just touches the surface of the water.

Sample

4. A sample shall be obtained by allowing grout to flow directly from the discharge into the container provided for this purpose. The sample shall be of sufficient size (approximately three gallons) to be representative of the grout mixture and must be free of any lumps large enough to restrict grout flow. Mixtures containing lumps large enough to invalidate test results shall be corrected prior to continuing procedure.

Procedure

5. (a) Prepare the cone by moistening the inside surface. This shall be done by placing a finger over the outlet of the discharge tube, filling the cone with water, then removing the finger and allowing the water to drain from the cone. The cone should be moistened within one minute before each test.

(b) Stir the grout sample obtained in paragraph 4, prior to testing, to assure uniformity of material. Measure and record temperature of mix and ambient air temperature.

(c) Place a finger over the discharge tube and fill the cone with a portion of the grout sample to the previously calibrated level. The flow cone shall be held firmly so that the top is parallel to the horizontal plane. Care must be exercised that the apparatus not be vibrated or moved in any manner during the testing operation. The grout surface should be in contact with the point gage. If the cone is overfilled, remove the finger and allow the extra grout to flow back into the sample container until the grout has reached the correct level. When the grout is at the proper level, start the stopwatch and simultaneously remove the finger. Stop the stopwatch when the discharge hole becomes visible from the top of the cone. The grout shall be allowed to run back into the container of grout from which the test sample was taken. The time indicated by the stopwatch is the time of efflux of the grout, and should be measured to the nearest 0.1 second.

(d) The cone shall be thoroughly washed between each test by submerging it in the container of water provided for this purpose.

(e) All tests for any given mixure shall be completed within ten minutes after completion of mixing of the grout components.

Testing Frequency

6. (a) Two tests shall be made for any grout mixture and the results averaged. This average shall be used to determine compliance with specifications.

(b) If the results of the initial two tests for a given batch differ by more than three seconds, two more tests shall be immediately run. The closest three results shall be averaged and this average used to determine compliance with specifications.

(c) A test shall be run on the first batch produced each day and at intervals of four hours during normal operations. Whenever normal operations are suspended for a period of one hour or more, proportions are changed, or a new ingredient is added to the mixture, the testing procedure, beginning with sampling, shall be repeated.

Report

7. All test results shall be documented for project files. This documentation shall include:

(a) Average time of efflux to the nearest 0.1 second.

(b) Temperature of sample at test.

(c) Ambient air temperature at test.

(d) Mix design of slurry.

Normal testing time is 10 minutes.