METHOD OF TEST FOR FLOW OF GROUT MIXTURES (FLOW CONE METHOD)

(A Modification of California Test Method 541)

SCOPE

1. (a) This method is intended to be used for determining the flow of grout mixtures as described in this test method.

(b) This test method may involve hazardous material, operations, or equipment. This test method does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user to consult and establish appropriate safety and health practices and determine the applicability of any regulatory limitations prior to use.

(c) See Appendix A1 of the Materials Testing Manual for information regarding the procedure to be used for rounding numbers to the required degree of accuracy.

(d) Metric (SI) units and values are shown in this test method with English units and values following in parentheses. Values given for metric and English units may be numerically equivalent (soft converted) for the associated units, or they may be given as rounded or rationalized values (hard converted). Either the metric or English units along with their corresponding values shall be used in accordance with applicable specifications. See Appendix A2 of the Materials Testing Manual for additional information on the metric system.

APPARATUS

2. Requirements for the frequency of equipment calibration and verification are found in Appendix A3 of the Materials Testing Manual. Apparatus for this test procedure shall consist of the following:

(a) Flow cone conforming to the dimensions indicated in Figure 1.

(b) Stop watch accurate to 0.1 second.

(c) Rubber stoppers.

(d) Sample container of four liter minimum capacity [a 152.4 mm x 304.8 mm (6 inch x 12 inch) concrete cylinder mold is adequate].

(e) Supporting ring for flow cone and stand [a 19 liter (5 gallon) bucket may be used], see figure 2.

SAMPLE

3. A representative sample shall be approximately 4 liters of grout.

PRECAUTIONS

4. (a) This test must be performed at a location that is free from vibration.

(b) The cone must be kept clean from cement build-up, especially in or near the orifice and nozzle.

PROCEDURE

5. (a) Determination of Efflux Time

1) Dampen flow cone and allow any excess water to drain. Place the cone in the supporting ring and insert the rubber stopper.

2) Level the cone, then pour the grout from the sample container into the cone until the grout Surface is level with the bottom of the holes in the side of the cone.

3) Remove the stopper and start the stopwatch simultaneously.

4) Stop the stopwatch at the first break or change in the continuous flow of grout from the discharge tube.

5) Dispose of the tested grout sample; rinse the equipment.

(b) Determination of Efflux After Quiescence

1) Fill cone with grout as previously described, using the remainder of the 4 liter sample.

2) Allow grout to rest in cone for 20 minutes ± 15 seconds from the instant the cone is filled. After the 20 minute quiescent period, remove the stopper and determine efflux time as described above.

EXAMPLE

6. Quiescent time (T_Q) is the amount of time that a sample of grout remains undisturbed (quiescent) in the flow cone and is expressed in minutes. Efflux time (T_E) is the amount of time that a sample of grout requires to run out of the flow cone after the plug is removed, expressed in seconds.

(a) Efflux time at the pump discharge:

$$T_E \geq 11 \text{ seconds (when } T_Q = 0 \text{ minutes)}$$

(b) Efflux time of grout sample at $T_Q = 20$ minutes:

$$T_E \text{ (at } T_Q = 20) \geq T_E \text{ (at } T_Q = 0) + 3 \text{ seconds,}$$

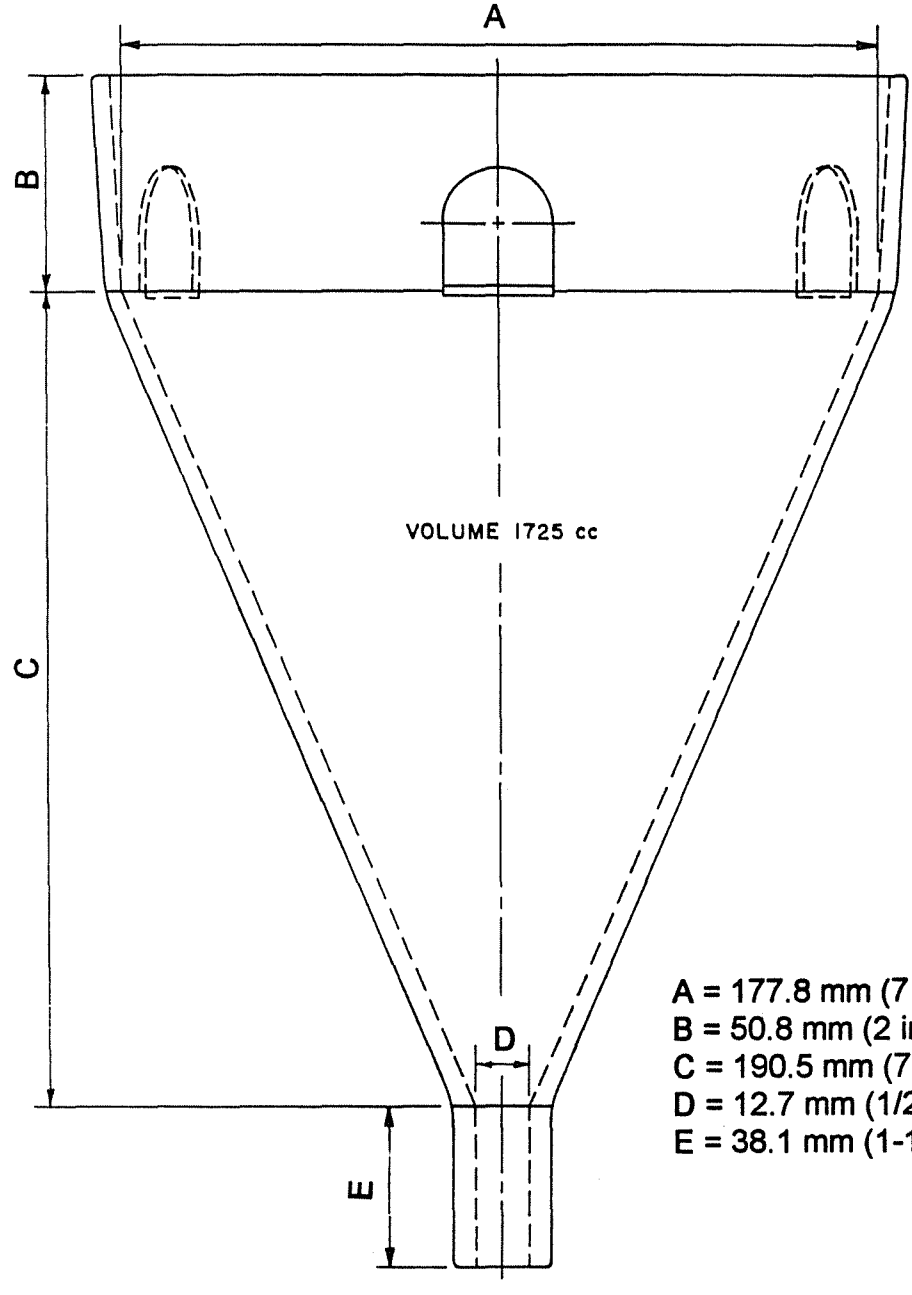
and

$$T_E \text{ (at } T_Q = 20) \leq T_E \text{ (at } T_Q = 0) + 8 \text{ seconds}$$

NOTE: The above mathematical expressions for quiescent time of 20 minutes are expressed as follows: "The efflux time after 20 minutes must be at least 3 seconds greater than the initial efflux time (Quiescent Time = Zero) and not more than 8 seconds greater than the initial efflux time."

REPORT

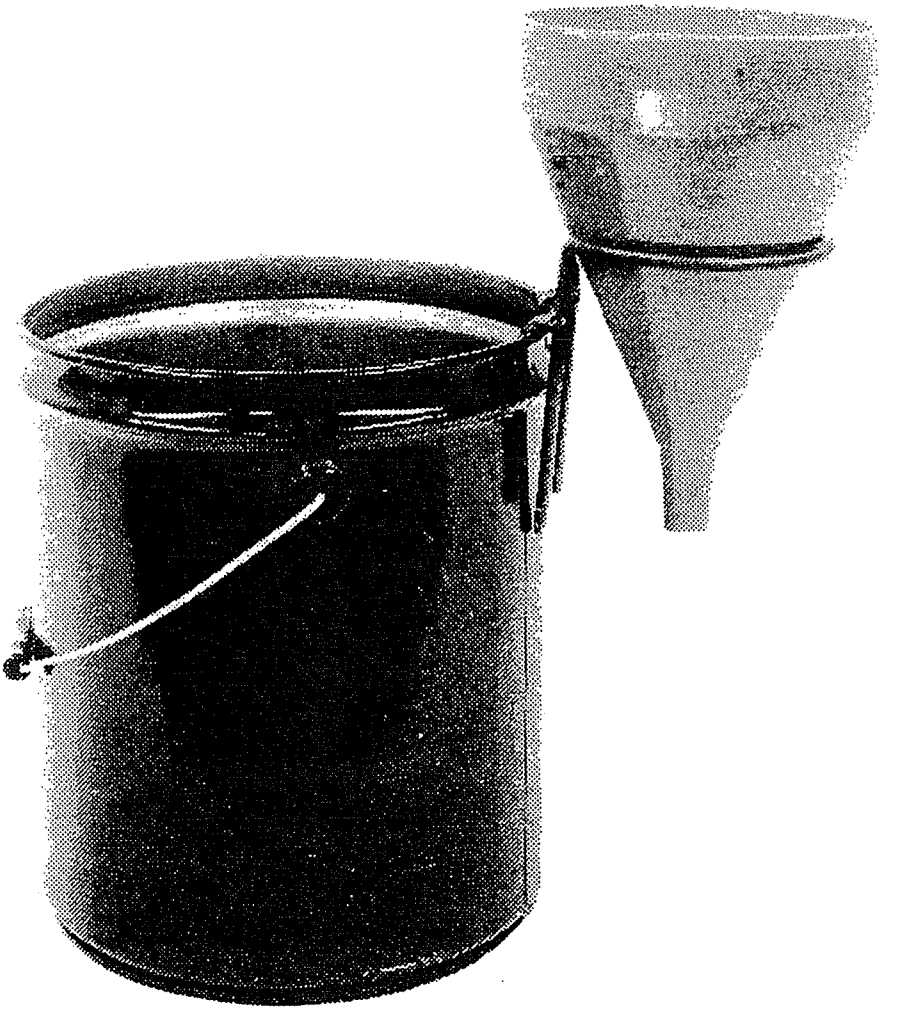
7. Report the efflux time to the nearest 0.1 seconds for both T_Q=0 and T_Q=20.



A = 177.8 mm (7 inches)
B = 50.8 mm (2 inches)
C = 190.5 mm (7-1/2 inches)
D = 12.7 mm (1/2 inch)
E = 38.1 mm (1-1/2 inches)

Grout Flow Cone

FIGURE 1



Grout Flow Test Apparatus

FIGURE 2