

**APPENDIX F – CALIFORNIA TEST # 541 (FLOW CONE METHOD)**

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY

California Test 541
November 2010**DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Transportation Laboratory
5900 Folsom Blvd.
Sacramento, California 95819-4612**METHOD OF TEST FOR FLOW OF GROUT MIXTURES
(FLOW CONE METHOD)****A. SCOPE**

This test method contains the procedure to be used for determining the flow of grout mixtures.

B. REFERENCES

ASTM C 939 – Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete
(Flow Cone Method)

C. APPARATUS

1. Flow cone and supporting ring conforming to the dimensions indicated in Figure 1.
2. Stopwatch having a least reading of not more than 0.1 s.
3. Rubber stoppers, size 00.
4. Sample container – 4 qt minimum capacity (a 6 in. × 12 in. concrete mold is adequate).
5. Suitable stand for supporting ring. A 5-gal paint bucket may be used. See Figure 2.

D. CALIBRATION

Before the first use of the flow cone, and periodically thereafter, check the calibration of the cone as follows:

1. Mount the flow cone firmly, free of vibration, and with the top vertical. Close the outlet of the discharge tube with a finger or stopper. Fill the cone with $1725 \text{ mL} \pm 5 \text{ mL}$ of water. Ensure that the water surface is at, but not overflowing, the indicators at the top of the Caltrans cone. For the ASTM cone, adjust the point gage to indicate the level of the water surface.
2. After ensuring the accuracy of the volume measurement, refill the cone with water and simultaneously remove the finger or stopper and begin the stopwatch. Stop the watch at the first break in the continuous flow of water.
3. The cone is calibrated if the volume of the cone is $1725 \text{ mL} \pm 5 \text{ mL}$ and the efflux time is $8.0 \text{ s} \pm 0.2 \text{ s}$.

E. SAMPLE

The test sample must be approximately 1 gal of grout.



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F. 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 three holes in the side of the cone (Caltrans cone) or makes contact with the point gage (ASTM 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. Record the indicated time of efflux to the nearest 0.1 s.
5. Dispose of the grout sample and rinse the equipment.

G. DETERMINATION OF EFFLUX AFTER QUIESCENCE

1. Fill cone with grout, as previously described, using remainder of 1 gal sample.
2. Allow grout to rest in cone for 20 min \pm 15 s from the instant the cone is filled to the time the efflux time is to be measured. After the 20-min quiescent period, determine efflux time as described previously in F.3 and F.4 above.
3. Record efflux time of the grout to the nearest 0.1 s.
4. Dispose of the grout sample and clean the equipment.

H. PRECAUTIONS

The cone must be placed in a location that is free from vibration.

The cone must be kept clean from cement buildup, especially in or near the orifice and nozzle.

The presence of solid particles retained on the No. 8 sieve or lumps of unmixed material in the grout may interfere with grout discharge and result in a false consistency.

I. HEALTH AND SAFETY

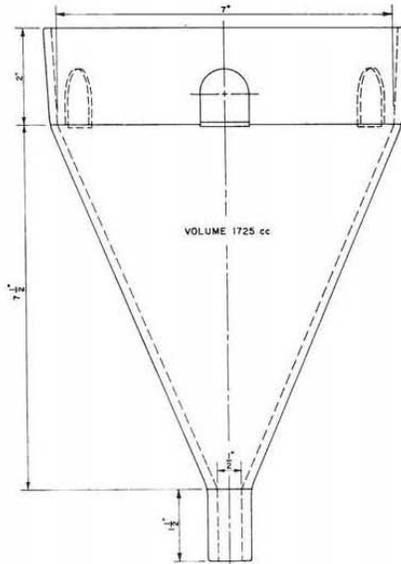
It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Prior to handling, testing or disposing of any materials, testers must be knowledgeable about safe laboratory practices, hazards and exposure, chemical procurement and storage, and personal protective apparel and equipment.

Caltrans Laboratory Safety Manual is available at:

http://www.dot.ca.gov/hq/esc/ctms/pdf/lab_safety_manual.pdf

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(Optional - From ASTM C939)

Figure 1: GROUT FLOW CONE



Figure 2: GROUT EQUIPMENT



Photo F-1 – Testing Efflux Time of Grout.

The *Standard Specifications*⁵⁷ specifies that the Department tests efflux time of grout under *California Test 541*.

⁵⁷ 2010 SS, Section 50-1.01D(2), *Quality Assurance Testing*