STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY

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METHOD OF TEST FOR BALL PENETRATION IN FRESH PORTLAND CEMENT CONCRETE

CAUTION: Prior to handling test materials, performing equipment setups, and/or conducting this method, testers are required to read "SAFETY AND HEALTH" in Section F of this method. It is the responsibility of the user of this method to consult and use departmental safety and health practices and determine the applicability of regulatory limitations before any testing is performed.

A. SCOPE

This test method describes the procedure for determining the consistency of fresh concrete by measuring the depth of penetration of a metal mass into plastic concrete under the force of gravity. This method is a modification of ASTM Designation: C 360 and AASTHO Designation: T-183.

B. APPARATUS

The ball penetration apparatus consists of a 152 mm steel cylinder with a hemispherically shaped bottom which is machined to a smooth finish. The penetrator is attached to a shaft graduated to measure penetration to the nearest 5 mm. The mass of the apparatus (ball, shaft, and handle), exclusive of the yoke, is 13.6 ± 0.05 kg.

1. Lightweight Concrete. A modified ball is used for determining the consistency of fresh lightweight concrete. The modified ball is identical in shape and size to the 13.6 kg ball, but the mass of the lightweight apparatus (ball, shaft, and handle), exclusive of the yoke, is 9.05 ± 0.05 kg.

2. Calibration. Zero reading is established by placing the ball and the feet of the yoke on a plane surface. The shaft is then adjusted by turning the threaded shaft in the ball penetrator to obtain a zero reading at the top of the sleeve. The lock nut at the top of the penetrator is then tightened, See Figure 1.

C. TEST PROCEDURE

1. The ball penetration test may be made on concrete in a wheelbarrow, buggy, or other container, or after it has been deposited in the forms or on the subgrade. The depth of the concrete above the bottom of the container or reinforcement shall be at least 150 mm for 25 mm maximum size aggregate or smaller, and 200 mm for larger maximum-size aggregate.

2. The surface of the concrete to be tested is struck off level over an area of about 0.30 m^2. Do not tamp, vibrate or consolidate the concrete. Screed the minimum amount required to obtain a reasonably level surface. Overworking may flush excess mortar to the surface and cause erroneously high penetration readings.

3. Hold the device by the handle; lower it slowly over the prepared area until the feet of the yoke touch the surface of the concrete. Make certain the shaft is in a

vertical position and free to slide through the yoke. Gradually lower the ball penetrator into the concrete, maintaining enough restraint on the handle so that penetration is due to the dead load of the ball only and not to any force generated by acceleration of the mass. When the ball comes to rest, release the handle and read the penetration to the nearest 5 mm. Penetration of the feet of more than 3 mm may indicate that the concrete has been overworked in screeding the surface, or that the yoke is binding on the shaft.

4. Take a minimum of three individual readings for each penetration determination. Individual readings shall be at least 250 mm between centers. The minimum horizontal distance from the centerline of the handle to the nearest edge of the level surface on which the test is made shall be 150 mm. The reported penetration shall be the average of the first three successive readings, which agree within 15 mm of penetration.

D. REPORTING OF RESULTS

Report to the nearest 5 mm, the average of the three readings as "_____ millimeter of penetration."

E. NOTES:

Accuracy is impaired if the surface of the ball is roughened by scratches, dents, or adhering mortar. It should be cleaned carefully after each test and always kept in the carrying case when not in use to prevent damage.

F. SAFETY AND HEALTH

Prior to handling, testing or disposing of any waste materials, testers are required to read: Part A (Section 5.0), Part B (Sections: 5.0, 6.0 and 10.0) and Part C (Section 1.0) of Caltrans Laboratory Safety Manual. Users of this method do so at their own risk.

REFERENCES:
ASTM Designation: C 360
AASTHO Designation: T-183

End of Text (California Test 533 contains 3 pages)

FIGURE 1
Picture of Ball on Table Showing Condition at Zero Penetration