

State of Nevada
Department of Highways
Materials and Testing Division

METHOD OF TEST FOR BALL PENETRATION IN
FRESH PORTLAND CEMENT CONCRETE

SCOPE

This test method describes the procedure for determining the consistency of fresh concrete by measuring the depth of penetration of a metal weight into plastic concrete. This method is a modification of ASTM Designation C360 and AASHTO Designation T183.

APPARATUS

The ball penetration apparatus consists of a six (6) inch (152.4 mm) diameter steel cylinder with a height of 4-5/8 in. (117.48 mm) 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 1/4 inch (16.35 mm). The weight of the apparatus (ball, shaft, and handle), exclusive of the yoke, is 30 pounds \pm 0.1 of a pound (13.61 \pm 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 30 pound (13.61 kg) ball, but the weight of the lightweight apparatus (ball, shaft, and handle), exclusive of the yoke, is 20 pounds \pm 0.1 of a pound (9.1 \pm 0.05 kg).
2. **Handle.** The handle shall be a metal rod, 1/2 in. (13 mm) in diameter and graduated in increments of 1/4 in. (6.4 mm), with each inch numbered from the zero point at the stirrup. The handle may be T-shaped or a closed rectangle at the top to permit grasping by the hand.
3. **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.

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 six (6) inches (152.4 mm) for one (1) inch (25 mm) maximum size aggregate or smaller, and eight (8) inches (203.2 mm) for larger maximum size aggregate.
2. The surface of the concrete to be tested is struck off level over an area of about three square feet. 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. Holding 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 weight 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 1/4 inch (6.4 mm). Penetration of the feet of more than 1/8 inch (3.2mm) 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 nine (9) inches (228.6 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 six (6) inches (152.4 mm). The reported penetration shall be the average of the first three successive readings which agree within one (1) inch (25.4 mm) of penetration.

REPORTING OF RESULTS

Report to the nearest 1/4 inch (6.4 mm), the average of the three readings as ". inches (mm) of penetration".

NOTE

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.

REFERENCE

- ASTM Designation C360
- AASHTO Designation T183
- Test Method No. Calif. 533