Section 1

Overview


This method covers apparatus, materials and procedures for capping hardened concrete cylinders and cores with high strength gypsum plaster or sulfur mortar. This method is a modification of ASTM C 617 and AASHTO T 231.

Units of Measurement

The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.
Section 2

Apparatus

The following apparatus is required:

♦ Capping plates, a glass plate at least 6 mm (1/4 in.) thick, a machined metal plate at least 13 mm (1/2 in.) thick, or a polished plate of granite or diabase at least 76 mm (3 in.) thick. Plates must be at least 25 mm (1 in.) greater in diameter than the test specimen, and the working surfaces should not depart from a plane by more than 0.05 mm (0.002 in.) in 152 mm (6 in.).

• The surface roughness of newly finished metal plates must not exceed that set forth in Table 4 of American National Standard B46.1, or 3.2 μm (125 in.) for any type of surface and direction of lay.

• The surface, when new, should be free of gouges, grooves, or indentations beyond those caused by the finishing operation.

• Metal plates that have been in use must be free of gouges, grooves, and indentations greater than 0.25 mm (0.010 in.) deep or greater than 32 mm² (0.05 in.²) in surface area.

• If a recess is machined into the metal plate, the thickness of the plate beneath the recessed area must be at least 13 mm (1/2 in.). The recess in the plate should never be deeper than 13 mm (1/2 in.).

NOTE: In vertical capping devices, two-piece metal capping plates are advantageous as this facilitates refinishing of the capping surface, if necessary. In such devices, the lower section is a solid plate and the upper section has a circular hole that forms the recess. The two sections are customarily fastened together with machine screws. A Rockwell hardness of 48 HRC is suggested for the upper surface of the lower plate.

♦ Alignment devices, such as guide bars or bull's-eye levels, to ensure that no cap departs from perpendicularity to the axis of a cylindrical specimen by more than 0.5° (3.2 mm in 305 mm [1/8 in. in 12 in.]). The same requirement is applicable to the relationship between the axis of the alignment device and the surface of a capping plate when guide bars are used. In addition, the location of each bar with respect to its plate must be such that no cap will be off-centered on a test specimen by more than 2 mm (1/16 in.).

♦ Melting pots for sulfur mortars, equipped with automatic temperature controls, and made of metal or lined with a material that is non-reactive with molten sulfur.

CAUTION: Equipping melting pots with peripheral heating will ensure against accidents during reheating of mixtures with a crusted surface. If using a melting pot not so equipped, use a metal rod to avoid a build-up of pressure under the hardened crust on subsequent reheating. The rod should contact the bottom of the pot, project above the surface of the fluid sulfur mix, and be of sufficient size to conduct enough heat to the surface during reheating to first melt a ring around the rod to avoid pressure buildup. A large metal ladle can be substituted for the rod.
- Feeler gauges
- Metal rods
- Ladle, large metal
- Straight edge.
Section 3

Materials

The following materials are required:

♦ High Strength Gypsum Cement (without fillers or extenders added subsequent to its manufacture) may be used, if 50 mm (2 in.) cubes develop a strength of at least 34.5 MPa (5,000 psi) when subjected to the same environment for the same length of time as capped specimens. Make cubes according to the procedure in ASTM C 472, using the same percent of mixing water as will be used in preparing the capping material.

NOTE: Low-strength molding plasters, commonly called plaster of Paris, or mixtures of plaster and Portland cement, are unsuitable for capping specimens.

NOTE: The percent of mixing water based on the weight of the high-strength gypsum cement should be between 26 and 30. Use of minimum percentages of mixing water and vigorous mixing will usually permit development of acceptable strength at 1 or 2 hours.

♦ Sulfur mortar, proprietary or laboratory prepared, may be used if allowed 2 hours to harden. Sulfur mortar should have a minimum compressive strength at 2 hours of 34.5 MPa (5,000 psi).

The strength of the capping material shall be determined on receipt of a new lot and at intervals not exceeding three months. Do not use a given lot of the capping material if it fails to conform to the strength requirements. Strength tests of the replacement material should be made weekly until four consecutive tests determine conformation to specifications.
Section 4

Capping Cylindrical Concrete Specimens

The following procedures describe how to cap cylindrical concrete specimens:

General

Caps should be about 3 mm (1/8 in.) thick and never more than 8 mm (5/16 in.) thick.

If either or both ends of a specimen have coatings or deposits of oily or waxy materials that would interfere with the bond of the cap, remove them.

If necessary, the ends of a specimen may be slightly roughened with a steel file or wire brush to produce proper adhesion to the cap.

Coat capping plates with a thin layer of mineral oil or grease to prevent capping material from adhering to the surface of the plate.

Sulfur mortar caps must be formed against metal or stone plates.

Capping with High Strength Gypsum Plaster

Mix high-strength plaster for capping, using the same percent of mixing water as was used in making the qualification test.

Capping with Sulfur Mortar

Prepare sulfur mortar for use by heating to about 130 °C (265 °F), as periodically determined by an all-metal thermometer inserted near the center of the mass.

Fresh sulfur mortar must be dry when placed in the pot as dampness may cause foaming. Keep water away from molten sulfur mortar for the same reason.

The capping plate or device should be warmed slightly to slow hardening rate and permit production of thin caps. Oil capping plate lightly.

Stir molten sulfur mortar immediately prior to pouring each cap.

The ends of moist cured specimens should be dry enough at the time of capping to preclude formation of steam or foam pockets under or in the cap larger than 6 mm (0.25 in.) in diameter.

To ensure that the cap bonds to the end of the specimen, do not oil the end prior to application of the cap.
Tap cap with a light metal implement. A hollow sound indicates that an unsatisfactory mortar cap was produced.

**NOTE:** Do not reuse sulfur mortar.

**CAUTION:** Hydrogen sulfide gas may be produced during capping when sulfur mortar is contaminated with organic materials such as paraffin or oil. The gas is colorless and has a notoriously bad odor of rotten eggs, however, the odor should not be relied upon as a warning sign, since the sensitivity to the odor disappears rapidly. High concentrations are lethal. Less concentrated dosages may produce nausea, stomach distress, dizziness, headache, or eye irritation. It is mandatory that the melting pot is located under a hood or near an exhaust fan and that the capping area be well ventilated. Further, heating sulfur over an open flame is dangerous because its flash point is approximately 185 °C (370 °F) and the mixture may ignite. If this occurs, cover the pot to snuff out the flame, and recharge the pot with fresh material.

**Daily Check**

During each day's capping operation, check the planeness of the caps on at least three specimens, representing the start, middle, and end of the run, by means of a straight-edge and feeler gauge, making a minimum of three measurements on different diameters to ensure that the surfaces of the caps do not depart from a plane by more than 0.05 mm (0.002 in.).
Section 5

Protecting Specimens after Capping

After capping, protect the specimens as follows:

♦ Between capping and testing, return specimens to moist storage or wrap with a double layer of wet burlap.

♦ Do not immerse specimens with gypsum plaster caps in water or store in a moist room for more than 4 hours.

♦ If stored in a moist room, protect plaster caps from dripping water.