WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

CAPPING CONCRETE CYLINDERS

1.0 PURPOSE

1.1 To provide technicians and supervisory personnel with standard procedures for capping concrete cylinders.

2.0 SCOPE

2.1 This procedure details methods for capping concrete cylinders for compressive strength testing. As a normal policy all cylinders will be capped. ASTM C-617 provides for capping of freshly molded cylinders with neat portland cement pastes, and capping of hardened cylinders with high-strength gypsum plaster or sulfur mortar. All methods specified in ASTM C-617 are permitted. This procedure will detail procedure for sulfur mortar capping, steel end plates with rubber insert as described in WVDOH Research Project 52 (RP-52) and special capping procedures.

3.0 SULFUR MORTAR CAPS

3.1 Capping Equipment

3.1.1 The capping jig shall have angle iron or other suitable guides capable of aligning the cylinder to insure the perpendicularity of the cap surface to the long axis of the cylinder as set forth in ASTM C-617.

3.1.2 Capping Plates - The capping plate shall meet the requirements of ASTM C-617.

3.1.3 Melting Pot - The melting pot should be of a type as described in ASTM C-617.

3.1.4 Capping Material - The capping material shall meet the requirements of ASTM C-287.

3.2 Miscellaneous Supplies

3.2.1 Light cup grease

3.2.2 A large dipper

3.2.3 Scraper (A small putty knife is suggested)

3.2.4 Rubber mallet

3.2.5 Ball peen hammer

3.2.6 Wire brush

3.3 Preparation

3.3.1 Before capping, all loose particles must be removed from the ends of the cylinder with a wire brush; the end should be free from laitance and moisture.

3.3.2 When a sulfur type capping material is used, it should be heated until it is thick and viscous. The right temperature of the mixture for capping is determined through observation and experience. If a commercial preparation is used, the manufacturer's recommendation should be followed as to the temperature. Overheating of the mixture should be avoided as this tends to make the cap rubbery rather than brittle as desired.

3.3.3.1 Sulfur type capping materials are best heated and maintained in a molten condition in a thermostatically controlled, electrically heated pot. If the sulfur type caps are salvaged from test cylinders (not recommended) the material should be separately melted and strained through a sieve having about 3.2 mm openings before adding to the material to be used for future capping.

3.4 Procedure

3.4.1 Enough material to make the cap is poured into a lightly greased capping plate placed in a capping jig. The cylinder is held in both hands against the angle guide of the jig and then, holding it in this position, pressed firmly into the melted material. This operation should be done quickly, before solidification begins, so that the mixture will adhere to the specimen. Caps should be as thin as practical and should not flow or fracture when the specimen is tested. Allow the cylinder to remain in the jig undisturbed, until the capping material has cooled to a hardened condition, then the excess material is scraped off the top of the capping plate. The cylinder is then removed from the capping plate by gently tapping the plate with a rubber mallet. All sulfur type caps should be allowed to harden for at least two hours before the cylinder is tested.

3.4.2 If the end of the cylinder is rough or has any depression more than 6.3 mm deep, a strip of paper about 50.8 mm wide should be placed so as to form a projecting collar around the cylinder and held in place with a rubber band. Capping material can then be poured into the smooth surface. When this material has hardened, the paper collar is removed and the final capping done in the usual way.

3.5 Testing the Cap

3.5.1 Before testing a cylinder, the cap should be tested for air pockets by tapping it lightly, with the handle of a putty knife or other suitable instrument. A cap that sounds hollow in places should be removed and replaced by a good, solid cap. Solid caps are easily obtained if the capping surface is dry and clean, the mixture is at the right temperature, and the cylinder is placed immediately in the melted mixture on the capping plate. The bearing surface of a capped cylinder is checked by the use of a straightedge and a feeler gage. The straightedge is moved across both diagonals, measuring the gap between the straightedge and the cap with the feeler gage. The capped surface shall be plane within 0.05 mm. The capped surface shall meet the perpendicularity requirements of ASTM C-617. Any cap found unsuitable shall be removed by tapping the cap with a ball peen hammer.

4.0 STEEL END CAPS WITH RUBBER INSERT

4.1 Capping Equipment

4.1.1 Steel end caps - Two required from mild cast steel with an overall thickness of about 63.5 mm and an overall diameter of about 190.5 mm. Each cap has a cavity about 25 mm in depth and about 165 mm in diameter. It is recommended that handles be fabricated and welded to the cap to facilitate handling.

4.1.2 Rubber Insert - in the cavity of the steel cap insert a snugly fitting disk of rubber composition compression material of about 12.7 mm thickness. The material shall be a minimum of 50 durometer hardness rubber type material.

4.2 Procedure

4.2.1 The bottom cap shall be centered on the lower bearing block of the testing machine and the cylinder centered and placed on the rubber insert. The top cap shall then be placed over the cylinder with the rubber insert centered over and in contact with the cylinder. Laboratory experience has shown that rubber inserts should be replaced after 15 compression tests when using a 50 durometer material.

5.0 SPECIAL CAPPING PROCEDURE

5.1 Cylinders with any of the following defects shall be capped with a neat cement paste.

5.1.1 Ends of cylinders are convex by more than 0.5 mm.

5.1.2 Aggregate or other objects protrudes from the ends by more than 5.08 mm.

5.1.3 Ends differ from right angles to the specimen axis by more than 7.6 mm in the 152 mm specimen diameter.

5.1.4 Other irregularities which result in a cap thickness greater than 6.3 mm over most of the cap area.

5.2 Preparation of Specimen

5.2.1 The specimen ends should be wetted, wire brushed, and cleaned.

5.3 Procedure

5.3.1 Plastic, preshrunk, high strength cement paste ("Hydrostone" or "Hydrocal White" etc.) shall be applied, troweled to a slightly coned surface, and molded in a true plane normal to the specimen axis with a minimum practicable thickness. Molding of the specimen ends can be accomplished with a piece of plate glass. To prevent sticking of the plate glass a 50-50 mixture of lard oil and paraffin or a piece of wet paper can be applied to the plate glass.

5.3.2 Cement paste caps should be moist cured for at least several days with the specimen. If a rapid hardening cap is required, the cement paste can be accelerated as necessary with calcium chloride, soda ash, or plaster of paris. When accelerators are used, it is preferable to use moderate amounts and permit caps to harden at least 24 hours.

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