

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

MATERIALS PROCEDURE

METHOD OF TEST FOR DETERMINING MORTAR STRENGTH

- 1.0 PURPOSE
 - 1.1 To provide a method of testing to determine the effects of organic impurities in fine aggregate on mortar strength.
- 2.0 SCOPE
 - 2.1 This procedure is applicable to fine aggregate to be used in concrete that has been tested and deemed darker than the standard in accordance to the guidelines established in AASHTO T21 and Section 702.1.4 of the West Virginia Standard Specifications.
- 3.0 APPLICABLE PROCEDURES
 - 3.1 AASHTO T21
 - 3.2 AASHTO T84
 - 3.3 ASTM C109
 - 3.4 ASTM C230
 - 3.5 ASTM C305
 - 3.6 ASTM C511
 - 3.7 ASTM C778
- 4.0 APPARATUS
 - 4.1 Nonabsorbent pan of sufficient size to hold and manipulate the sample.
 - 4.2 Drying device with variable temperature control capable of producing a flowing stream of warm air.
 - 4.3 Cone and tamping rod conforming to the requirements of Section 6.2.1 of AASHTO T84.

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- 4.4 Balance having a capacity 5000 grams and sensitive to the nearest 0.1 gram.
 - 4.5 A variable speed planetary and revolving motion mixer with paddle blades conforming to the requirements of ASTM C305.
 - 4.6 Flow Table, conical mold, and calipers conforming to the requirements of ASTM C230.
 - 4.7 Specimen molds and tamper conforming to requirements ASTM C109.
 - 4.8 Moisture cabinet conforming to the requirements of C511.
 - 4.9 Compression apparatus capable of at least a 20,000 pound load.
 - 4.10 Nonabsorbent containers for holding excess fine aggregate and cement.
 - 4.11 Distilled water.
 - 5.0 PROCEDURE
 - 5.1 Approximately 5000 grams is obtained from field sample.
 - 5.2 Dry sample to SSD condition, remove and weigh out a portion to be used in the test. This is an estimate of the amount needed to bring the mix to the right consistency. Weigh out additional sand to be added if needed. Place each in an airtight container. Cover remaining sample with a damp cloth.
 - 5.3 Pre-measure 360 ml of distilled water into a total drain (TD) beaker. Add the 360 ml of distilled water into the mixing bowl and let beaker drain for 30 seconds.
 - 5.4 Add 600 grams of Type III cement to water in mixing bowl. Start mixer and mix at slow speed (140 +/- 10 r/min) for 30 seconds.
 - 5.5 Slowly add the fine aggregate over the next 30 seconds while continuing mixing at slow speed.
 - 5.6 Switch mixer to medium speed (285 +/- 10 r/min) and mix for 30 seconds.
 - 5.7 Stop mixer and let stand for 90 seconds. During the first 15 seconds quickly scrape the material collected to the side of the bowl into the batch. Cover the bowl.
 - 5.8 Remove the cover and mix for 60 seconds at medium speed. If the mix appears too wet, add additional fine aggregate during the first 30 seconds. At the end of 60 seconds stop mixer and remove bowl.

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- 5.9 Perform flow test on the mixture in accordance with ASTM C109 with the exception that the table will be dropped 10 times to achieve desired flow of 100 +/- 5 mm.
- 5.10 If the flow is less than the target tolerance, the sample will be discarded and the test started over.
- 5.11 If the flow is greater than the desired target, place the sample back into the bowl and place the bowl in the mixer, add additional sand as needed, then remix for 30 seconds.
- 5.12 Check flow as described in 5.9. If the flow is within the target tolerance a set of compressive strength cubes will be made in accordance with ASTM C109. The cubes will be tested for compressive strength at three days.
- 5.13 A control sample will be prepared of Ottawa sand. Compressive strength cubes will be made in accordance with ASTM C109 with the exception that the sand will not be taken to SSD. New control shall be performed with each shipment of cement.

6.0 CALCULATION

- 6.1 The average of the compressive strength breaks of the control samples will be divided into the average of the breaks of the fine aggregate being tested.

$$(\bar{X}_t / \bar{X}_c) = \text{relative compressive strength of test sample.}$$

where: $\bar{X}_c$ = average test results of control sample.

$\bar{X}_t$ = average test results of test sample.

7.0 REPORTING

- 7.1 The results will be reported out to the nearest 0.1



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