

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

MATERIALS PROCEDURE

STANDARD METHOD OF TEST FOR DETERMINING THE QUALITY
OF WATER USED WITH HYDRAULIC CEMENT

1. PURPOSE

- 1.1 To establish a standard method of test and acceptance criteria to be used in determining the quality of water used with hydraulic cement.

2. PURPOSE

- 2.1 This procedure is applicable to untreated water sources used in combination with mixtures containing hydraulic cement. An untreated water source may be defined as a source other than a treated public water system.
- 2.2 Treated water systems may be used without testing.

3. APPLICABLE DOCUMENTS

- 3.1 MP 642.40.20
- 3.2 AASHTO T 106
- 3.3 AASHTO T 162
- 3.4 ASTM C 191

4. PROCEDURE

- 4.1 Untreated water shall be tested at the source for pH. When the pH of the water is between 4.5 and 8.5 no further testing is necessary.
- 4.2 If the pH is less than 4.5 or more than 8.5, all tests listed in this procedure will be conducted. A water source whose pH is determined to be within the limits defined in section 4.1 but appears to be contaminated with foreign material which could have an adverse effect on the Portland cement concrete shall have a sample forwarded to the Materials Division and all tests listed in this procedure will be conducted. The sample shall be accompanied with the required documentation indicating the sampler's reasons for requesting testing. These tests shall be conducted before first use and thereafter once every 6 months, or more often when there is reason to believe that a change has occurred in the characteristics of the water source.

5. TEST METHODS

- 5.1 Total Solids Content, Chloride as Cl^- , Sulfate as SO_4 , and Alkalies as $(\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O})$
- 5.1.1 Tests shall be conducted in accordance with MP 642.40.20.
- 5.2 Compressive Strength
- 5.2.1 The water under test shall be compared, in mortar, with distilled water. The proportions of dry materials in the mortar shall be 500 grams of Type III Cement, 1500 grams of graded OTTAWA sand and the amount of water sufficient to produce a flow of 110 ± 5 in 25 drops in accordance with AASHTO T 106 using the sample under test and compared to three specimens made using distilled water.
- 5.3 Time of Setting by Vicat Needle
- 5.3.1 Time of set will be prepared with the test sample and Type III Cement in accordance with ASTM C191. A control specimen will be made with distilled water for basis comparison.

6. ACCEPTANCE CRITERIA FOR UNTREATED WATER SOURCES

Performance Requirements for Untreated Water Source	
Requirements for Mixing Water	Limit
Compressive Strength (Min% Control at 1 day)	90
Time of Set, (deviation from control)	-60 to +90 minutes

Chemical and Physical Limits for Untreated Water Source	
Maximum Concentration in Combined Mixing Water, ppm	Limit
A Chloride as Cl^- , ppm	
In prestressed concrete or bridge decks	500
Other reinforced concrete in moist environments or containing aluminum embedments or dissimilar metals or with stay-in-place galvanized metal forms	1,000
B Sulfate as SO_4 , ppm	3,000
C Alkalies as $(\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O})$, ppm	600
D Total solids by mass, ppm	50,000


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