T 21

ORGANIC IMPURITIES IN FINE AGGREGATE FOR CONCRETE FOP FOR AASHTO T 21

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02

Scope

This method of test covers a procedure for an approximate determination of the presence of injurious organic compounds in natural sands, which are to be used in cement mortar or concrete.

In this procedure a sample of fine aggregate is placed in a sodium hydroxide solution and shaken. The following day the color of the supernatant solution is compared with a standard color. If the color is darker than the standard, the fine aggregate should not be used without further investigation.

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Significance

Aggregates are potentially harmful if they contain compounds known to react chemically with portland cement and other constituents of the portland-cement concrete, and produce undesirable properties such as expansion of the paste or aggregates, reduction in strength, etc.

Organic impurities may delay setting and hardening of concrete, may reduce strength gain, and in unusual cases may cause deterioration.

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Apparatus

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- **Balance or Scale:** Capacity of 1000 g and sensitive to 0.1 g
- **Bottles:** Clear (colorless), graduated glass bottles having a capacity of 8 to 16 fl. oz. with water tight stoppers or caps. Outside diameter (measured along the line of sight used for color comparison) 1.5 in to 2.5 in.
- **Glass Color Standard:** Glass color plate with organic plate numbers 1-5. (Organic plate No. 3 to be equal to Gardener Color Standard No. 11)

06 **Reagent and Standard Color Solution**

- **Reagent Sodium Hydroxide Solution:** 3 parts NaOH to 97 parts water by mass.
- **Standard Color Solution:** Solution of reagent grade Potassium Dichromate dissolved in sulfuric acid. Solution to be freshly made (within 2 hours), equal to Organic Color No. 3.

07 **Sampling**

Obtain a representative sample of fine aggregate according to the FOP for AASHTO T 2.

08 **Test Sample**

Using the FOP for AASHTO T 248, obtain a test sample weighing approximately 450 g. from the sand to be tested. If sample drying prior to testing is necessary, only air-drying shall be allowed.

09 **Procedure**

1. Fill a bottle to the 130 mL (4½ ounce) mark with the sand to be tested.
2. Add a sufficient amount of the 3 per cent sodium hydroxide solution to bring the level of the liquid, after shaking, to the 200 mL (7 ounce) mark.
3. Stopper the bottle and shake vigorously to eliminate air bubbles.

10 4. Allow the bottle to stand undisturbed for 24 hours. (Do not place bottle in direct sunlight).

11 5. At the end of the 24-hour standing period compare the color of the supernatant liquid against one of the reference color standards.

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Report

- Report on standard agency forms.
- Standard solution method: Record whether the supernatant liquid is lighter, darker, or equal in color to that of the reference standard.
- Glass color plate method: Record the organic plate number that is nearest the color of the supernatant liquid.

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Tips!

- Be cautious handling reagents. They are caustic and may cause serious skin or eye injury.
- Be careful handling sample bottle when color comparison is made. Disturbance of the contents may cause the liquid to become clouded, making color comparison difficult.

REVIEW QUESTIONS

1. From the sample that was obtained according to AASHTO T 2, how much material is generally required to perform this test?

2. According to this FOP, how may the sample be dried?

3. After addition of the NaOH solution, what must be done?

4. Describe the color comparison procedure.

PERFORMANCE EXAM CHECKLIST

ORGANIC IMPURITIES IN FINE AGGREGATES FOR CONCRETE
FOP FOR AASHTO T 21

Participant Name:_____ Exam Date:_____

Procedure

Sample Preparation

1. A representative sample of appropriate mass obtained by T 2 and T 248? _____
2. If sample is dried prior to testing, is it dried only by air-drying? _____
3. Sample weighs approximately 450 g? _____

Procedure

1. Sand added to the 4½ oz. (130 ml) level in the bottle? _____
2. NaOH solution added to the 7 oz. (200 mL) level? (7 oz. after shaking)? _____
3. Bottle stoppered and shaken vigorously? _____
4. Bottle, containing sample, allowed to stand for 24 hours? _____
5. Color comparison made against color standards? _____

Report

1. Standard agency forms? _____
2. Standard Color Solution Method
   a. Solution freshly made (within two hours)? _____
   b. Supernatant solution color lighter or darker than standard? _____
3. Glass Color Standard Procedure
   a. Proper Gardener Color Standards? _____
   b. Glass color standard closest to supernatant liquid color recorded? _____

Comments: First attempt: (Pass/Fail) ___ Second attempt: (Pass/Fail) ___

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Signature of Examiner_____.