FLORIDA DEPARTMENT OF TRANSPORTATION
State Materials Office
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Florida Method of Test for Determination of Acid Insoluble Material in Coarse Aggregates

Designation: FM 5-510

1. SCOPE

1.1 This method describes a procedure for determining the amount of inherent silica particles as polish resistant material in coarse aggregates for use in Asphalt Friction Course. This method assumes that acid insoluble material in coarse aggregates correspond to silica in sample. See Section 7 for limitations of this method.

Note 1: The values stated in SI units are to be regarded as standard. The values in parenthesis are for information only.

2. APPARATUS

2.1 Balance - Accurate to 0.1 grams

2.2 Sample splitter, conforming to FM 1-R 076

2.3 2 L glass beaker for acid digestion

2.4 Stainless Steel mesh sieves No. 10 (2.00 mm) and No. 200 (0.075 mm)

2.5 Forced-draft oven, capable of maintaining a temperature of 110° ±5°C (230° ±9°F)

2.6 Two (2) containers suitable to dry samples in oven. Container material should comply with requirements in Standard Method AASHTO T265.

3. REAGENTS

3.1 Hydrochloric Acid (HCl), Reagent Grade

3.2 Deionized (DI) Water

4. PROCEDURE

4.1 Obtain a representative sample of coarse aggregate resulting in a minimum 200 g sample retained on the No. 10 sieve (2.00 mm) by use of a sample splitter.

4.2 Remove the minus No. 10 material from the sample by washing over No. 10 (2.00 mm) sieve.

4.3 Dry the sample at 110° ±5°C in accordance with AASHTO T265.

4.4 Weigh 200g±10g from dried sample and record the mass for use in calculations.

4.5 Place the sample in a 2 L beaker and add sufficient DI water to fully cover the sample.

4.6 Prepare 1:1 (v/v) HCl aqueous solution by mixing 1 volume of acid with 1 volume of DI water. Slowly add 400 mL 1:1 (v/v) HCl (aq.) with sufficient pauses to prevent the foaming solution from overflowing the container.

4.7 When the effervescence has subsided, stir and place beaker on a hot plate, keeping the temperature slightly below boiling.

4.8 After the reaction ceases, add an additional 200 mL of 1:1 (v/v) HCl (aq.). Continue adding acid solution and heat until the addition of acid does not cause effervescence.

4.9 Remove from heat and add DI water until container is nearly full. Stir and allow to settle until solution is clear. Decant the sample over the No. 200 sieve (0.075 mm). Make sure to transfer all the content by washing the walls of the beaker with DI water.

4.10 Continue to wash the residue over a No. 200 (0.075 mm) sieve using DI water and leave it to air dry overnight.

4.11 Record the mass of a dry and clean container suitable to use in oven. Transfer the residue from the sieve to this container.

4.12 Dry to constant mass in accordance with AASHTO T265.

4.13 Remove from oven, place in desiccator to cool. Weigh and record the mass of the container with residue.

5. CALCULATION

5.1 Mass of Insoluble Material:

Mass (g) of Container with Sample (Section 4.13)
– Mass (g) of Container (Section 4.11)

5.2 % Acid Insoluble material:

$$\frac{\text{Mass (g) of insoluble material (Section 5.1)} \times 100}{\text{Mass (g) of original sample (Section 4.4)}}$$

6. REPORTING

6.1 Report percent Acid Insoluble material to nearest whole number.

7. LIMITATIONS

7.1 This method is intended primarily for evaluation of coarse aggregates consisting of carbonate (Limestone) or mixtures of carbonates (Dolomite) and silica sand (Sandstone). When the test is applied to other types of aggregates such as slags (which are generally calcium or iron silicates), there may be a partial digestion of the aggregate sample and the formation of silicic acid gel, which will give inaccurate results.

In this case, report the following:

"This material is observed to be a slag which contains significant amount of acid insoluble matter. Although insoluble, the composition is different from that of silica sand grains and may have different skid resistance qualities".