Kentucky Method 64-615-083
Revised 2/6/0302/21/08
Supersedes KM 64-615-031
Dated 2/16/0102/06/03

# DETERMINATION OF COAL AND LIGNITE IN AGGREGATES

1. SCOPE:

1.1. This method covers the determination of the percentage of coal and lignite in both fine and coarse aggregates. The determination in fine aggregate is made by means of sink-float separation in a heavy liquid of suitable specific gravity; the determination in coarse aggregate is made by visual classification.

1.2. The fine aggregate procedure generally follows AASHTO T 113 with slight modifications.

2. APPARATUS and MATERIALS:

2.1. Balance - Fine Aggregates: A balance having a capacity of not less than 500 grams, sensitive to 0.1 gram. Coarse Aggregates: A balance having a capacity of not less than 5000 grams, sensitive to 1 gram.

2.2. Containers: Suitable for drying the aggregate sample, holding aggregate during immersion and suitable for holding the heavy liquid during the sink-float separation.

2.3. Skimmer: A piece of No. 50 sieve cloth of suitable size and shape for separating the floating pieces from the heavy liquid.

2.4. Hot plate or oven capable of accuracy required in 3.2.

2.5. Sieves: No. 50 and No. 4 conforming to AASHTO M 92.

2.6. Hydrometer: A hydrometer conforming to the requirements of Section 5 through 11 of ASTM E 100.

2.7. The heavy liquid shall consist of a mixture of zinc bromide and water. The proportioning shall be such that the specific gravity of the mixture shall be maintained at 2.00 ± 0.01 at all times during testing. (Percentages by mass to produce the required specific gravity of 2.00 using zinc bromide and water are 66% zinc bromide and 34% water. (See Note 2) However, the specific gravity of the heavy liquid must be periodically verified by use of the hydrometer and adjustments made as necessary to maintain the required specific gravity.)

NOTE 1: CAUTION. Read warning statements in MSDS (Material/Safety Data Sheets) before initiating testing with zinc bromide.

NOTE 2: Heat is generated upon mixing zinc bromide and water. Zinc bromide should be added to water NOT the reverse.

3. SAMPLE:

3.1. Field samples shall be obtained in accordance with AASHTO T 2.

3.2. Test Portion: The test portion shall be prepared from the minimum field sample ~~shown~~ from AASHTO T 2 or below by: (1) reducing the sample in accordance with AASHTO T 248*, (2) oven-drying the reduced sample to constant mass at a temperature of 230 ± 9 °F and (3) after allowing the reduced sample to cool to room temperature, separating over a No. 4 sieve if coarse aggregate or over a No. 50 sieve if fine aggregate.

*The sample shall be reduced to a size such that the minimum mass of test portion (consisting of material retained on the No. 4 and No. 50 sieve, as applicable) shall not be less than that indicated in the following table:

| NOMINAL MAXIMUM SIZE OF AGGREGATE | MINIMUM MASS OF FIELD SAMPLE | MINIMUM MASS OF TEST PORTION |
|---|---|---|
| No. 4 or smaller | 10 lbs. | 200 grams |
| 3/8" | 30 lbs. | 3000 grams |
| 1" | 50 lbs. | 5000 grams |
| 2" | 90 lbs. | 10000 grams |

4. PROCEDURE:

4.1. Fine Aggregate: Weigh the material coarser than the No. 50 sieve to the nearest 0.1 gram, record as $W_2$ and bring to a saturated surface dry condition by means of the procedure specified in ~~AASHTO T 84(Note 3)~~KM 64-605. Introduce the test portion into the heavy liquid in a suitable container, the volume of the liquid being at least three times the absolute volume of the aggregate(Note 4). Using the skimmer, remove the pieces that rise to the surface, and save them. Repeatedly agitate the remaining pieces, and remove the floating pieces until no additional pieces rise to the surface. Wash the skimmed pieces in water. After drying, separate the coal and lignite from the skimmed pieces by visual inspection. Weigh and record the mass of the coal and lignite as $W_1$.

NOTE 3: If the absorption as determined in accordance with ~~AASHTO T 84~~KM 64-605 is known, the fine aggregate may be prepared for test by adding to a known mass of dry sand the amount of water it will absorb, mixing thoroughly, and permitting the sand to stand in a

covered pan for 30 minutes before use.

NOTE 4: Test portion may be introduced into the heavy liquid by slowly pouring the aggregate into the container that has already been placed in the heavy liquid. Partial separation of the lightweight particles will be achieved and will reduce the chance of lightweight particles being unable to float to the surface by becoming entrapped by other aggregate. Proceed with agitation.

NOTE 5: Normally the discrepancy between oven-dry mass and saturated-surface-dry mass of the skimmed particles will not significantly affect the calculated percentage of coal and lignite. If a more precise determination is required, the skimmed particles shall be dried to substantially constant mass at 230 ±9°F to determine the value of $W_1$ used for the calculation in Section 5.

4.2. Coarse Aggregate: Obtain the appropriate size test portion by wet sieving the sample over a No. 4 sieve and retaining the plus No. 4 material for testing. Spread the wet portion on a sufficient work area so that individual particles may be carefully inspected. Separate the coal and lignite from the test portion by visual classification. When separation has been completed, surface dry the coal and lignite, as well as the remaining portion of the original sample, and weigh each pile separately. Record the mass of the coal and lignite as $W_1$, and the remaining material as $W_3$.

5. CALCULATIONS:

Calculate the percentage of coal and lignite as follows:

$$\textit{Fine Aggregate : \% Coal and Lignite} = \frac{W_1}{W_2} \times 100$$

$$\textit{Coarse Aggregate : \% Coal and Lignite} = \frac{W_1}{W_1 + W_3} \times 100$$

Where:

$W_1$ = Dry mass of Coal and Lignite in sample.

$W_2$ = Dry mass of Plus No. 50 Materials (Fine Agg. Sample)

$W_3$ = Dry mass of remaining portion of plus No. 4 material after coal and lignite have been removed (Coarse Agg. Sample).

6. REPORT:

6.1. Report results to the nearest 0.1 of a percent.

6.2. When test results are obtained that do not fall within specification limits, the failure must be verified. The unused field sample is to be tested in the same manner as the original test sample. When the original and the verification test results are reasonably close, they are to be averaged to obtain a single reportable test result. When the two test results vary considerably, further investigation will be necessary. Investigation may include checking test equipment, reducing field sample to test sample practices, methods of calculations and/or obtaining an additional field sample to test.

APPROVED _____
DIRECTOR
DIVISION OF MATERIALS

DATE 02/21/08

~~APPROVED _____~~
~~Director~~
~~DIVISION OF MATERIALS~~

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