Kentucky Method 64-306-08
Revised 02/22/08
Supersedes 64-306-06
Dated 03/06/06

TEST FOR FREE MOISTURE CONTENT OF CONCRETE AGGREGATES

1. SCOPE: This method provides four optional methods for determining the free moisture content of fine and coarse aggregate to be used in concrete.

2. SAMPLING: The sample shall be taken in a manner which will be representative of the moisture condition of the aggregates, from portions of stockpiles proposed for immediate use and in an amount sufficient for the method of test to be used.

3. METHOD 1: FINE AGGREGATE: Speedy Moisture Tester Method:

   3.1. This method is performed by the use of an apparatus commonly referred to as a "Speedy Moisture Tester". This apparatus is calibrated to indicate free moisture content from gas pressure resulting when free moisture on the aggregate reacts chemically with a known quantity of calcium carbide.

   3.2. The apparatus manufacturer's recommended procedures shall be used for determining moisture content by this method. As the operational instructions vary somewhat with different tester manufacturers it is necessary to follow the instructions as provided with the specific equipment in use.

   3.3. The dial of this apparatus is supposed to indicate the per cent of free moisture contained in the sample. However, it has been determined by laboratory tests that this type apparatus actually measures part of the aggregate's absorbed moisture. Therefore, to obtain a more accurate free moisture content, subtract 1/2 of the absorption percentage furnished by the District Laboratory from the dial reading. Never use the manufacturer's correction chart accompanying the apparatus.

   3.4. Always run at least two tests when using a six gram speedy moisture tester and use the average as the free moisture content.

4. METHOD 2: FINE OR COARSE AGGREGATE:

   4.1. Total Moisture Content Minus Absorption Method: This method is intended to provide a means of obtaining the free moisture content of either fine or coarse aggregate by use of the total moisture content in terms of the dry weight (oven-dry) and the absorption percentage as furnished by the District Laboratory.

4.2. Apparatus:

4.2.1. Balance: A balance or scale accurate to 0.1 percent of the weight of the sample to be tested.

4.2.2. Heat Source: A source of heat such as an electric or gas hot plate, stove, oven, or microwave oven.

4.2.3. Sample Container:

4.2.3.1. Sample Container for Electric or Gas Hot Plate, Stove, or Oven: A metal container not affected by the heat, of sufficient volume to contain the sample without danger of spilling, and of such shape that the least lateral dimension will not be less than five (5) times the depth of sample.

4.2.3.2. Sample Container for Microwave Oven: A non-metallic container made of special thermal shock resistant material and of sufficient volume to contain the sample without any danger of spilling while being stirred.

4.2.4. Sample: The size of sample shall be in accordance with table 1.

4.3. Procedure:

4.3.1. Procedure for electric or gas hot plate, stove, or oven.

4.3.1.1. Weigh the sample to the nearest 1.0 gram, avoiding the loss of moisture to the extent possible.

4.3.1.2. Dry the sample thoroughly in the sample container, exercising care to avoid loss of any particles. With any heat source, other than a controlled temperature oven, stir the sample during drying to accelerate drying and avoid localized overheating. The sample is thoroughly dry when further heating causes, or would cause, less than 0.1 percent additional loss in weight.

4.3.1.3. Weigh the dried sample to the nearest 1.0 gram.

4.3.2. Procedure for microwave oven.

4.3.2.1. Weigh the sample to the nearest 1.0 gram, avoiding the loss of moisture to the extent possible.

4.3.2.2. Place the sample in the oven and dry for 3 minutes. (Observe the sample carefully during the first minute of heating to determine if any

particles start to turn red hot. If so, turn off the oven immediately, discard this sample, and start the test over with another sample.) At the end of 3 minutes of drying, stir the sample thoroughly. Dry the sample 3 additional minutes, stir again, and then weigh to the nearest gram. Repeat the 3 minute drying periods until further heating causes less than 0.1 percent additional loss in weight.

4.4. Calculations:

4.4.1. Calculate the free moisture content as follows:

$$P = \frac{W - [D(1 + A)]}{D(1 + A)} x\ 100$$

Where :

P = Free moisture content of sample in percent
W = weight of original sample in grams
D = weight of dried sample in grams
A = the decimal equivalent of the absorption percent as provided by the District Laboratory

Alternative Method:

$$P = \left[\left(\frac{W - D}{D}\right) x\ 100\right] - ABS$$

Where:

P = Free moisture content of sample in percent
W = weight of original sample in grams
D = weight of dried sample in grams
ABS = percent of absorption

5. METHOD 3: FINE AGGREGATE: Integrated Moisture Control Systems (Moisture Probe and Compensator)

5.1. The manufacturer's recommended procedures shall be followed for the installation and operation of the equipment.

5.2. The moisture apparatus shall be calibrated when installed, replaced, or repaired and once every three months thereafter by using Method 2 above.

5.3. The calibration of the moisture apparatus shall be within $\pm$ 0.2% of the free moisture as determined by Method 2.

6. METHOD 4: COARSE AGGREGATE:

6.1. Saturated-Surface Dry Condition Method: This method may be used to determine free moisture content of coarse aggregates directly from the loss in weight of a damp sample when it is dried to a saturated-surface dry condition by use of a towel. (This method is NOT applicable for determining the moisture condition of slag or aggregates which have less than zero free moisture i.e. have less absorbed moisture in them than they are capable of absorbing).

6.2. Apparatus:

6.2.1. Balance: The balance or scale shall be accurate to within 0.1 percent of the weight of the sample to be tested.

6.2.2. Sample Container: A metal container of sufficient volume to contain the sample without danger of spilling and of such shape that the least lateral dimensions will not be less than five (5) times the depth of the sample.

6.2.3. Towel: A towel or absorbent cloth of sufficient size to dry to sample to saturated-surface dry condition.

6.3. Sample: The size of the sample shall be in accordance with Table 1.

6.4. Procedure:

6.4.1. Weigh the original sample to the nearest 1.0 gram avoiding the loss of moisture to the extent possible.

6.4.2. Using a towel, wipe the surface moisture from the sample until it is a saturated-surface dry condition taking care to avoid loss of any of the sample by spilling or from particles clinging to the towel. A sample is defined as being in a saturated-surface dry condition when all aggregate particles have the dark appearance resulting from the absorbed water and no individual particles within the sample contain visible surface moisture. Surface moisture on an aggregate particle will give it a sheen or glossy appearance.

6.4.3. Immediately weigh the saturated-surface dry sample to the nearest 1.0 gram.

6.5. Calculate the free moisture content as follows:

$$P = \frac{W - W_{ssd}}{W_{ssd}} \, x \, 100$$

Where:

P = free moisture content of sample in percent

W = weight of original sample.

W_{ssd} = Weight of the saturated-surface dry sample.

TABLE 1

Designated Size of Aggregate	Minimum Weight of Test Portion, in Grams
Concrete Sand	1000
No. 78 or 9M	1000
No. 67 or No. 68	1500
No. 57 or No. 357	2000

APPROVED

DIRECTOR
DIVISION OF MATERIALS

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