

WSDOT FOP for AASHTO T 255¹

Total Evaporable Moisture Content of Aggregate by Drying

1. SCOPE

- 1.1 This test method covers the determination of the percentage of evaporable moisture in a sample of aggregate by drying, both surface moisture and moisture in the pores of the aggregate. Some aggregate may contain water that is chemically combined with the minerals in the aggregate. Such water is not evaporable and is not included in the percentage determined by this test method.
- 1.2 The values stated in English units are to be regarded as the standard. The values stated in parentheses are provided for information only.
- 1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. For specific precautionary statements, see 5.3.1, 7.2.1, and 7.3.1.*

2. REFERENCED DOCUMENTS

2.1 *AASHTO Standards:*

M 92	Wire-Cloth Sieves for Testing Purposes
M 231	Weighing Devices Used in Testing Materials
R 16	Regulatory Information for Chemicals Used in AASHTO Tests
T 2	Sampling of Aggregate
T 19/T 19M	Bulk Density ("Unit Weight") and Voids in Aggregate
T 84	Specific Gravity and Absorption of Coarse Aggregate
T 85	Specific Gravity and Absorption of Fine Aggregate

2.2 *ASTM Standards:*

C 125	Terminology Relating to Concrete and Concrete Aggregates
C 670	Practice for Preparing Precision Statements for Test Methods for Construction Materials

3. TERMINOLOGY

3.1 *Definitions:*

- 3.1.1 For definitions of terms used in this test method, refer to ASTM C 125.

¹ This FOP is based on AASHTO T 255-00.

4. Significance and Use

- 4.1 This test method is sufficiently accurate for usual purposes, such as adjusting batch quantities of ingredients for concrete. It will generally measure the moisture in the test sample more reliably than the sample can be made to represent the aggregate supply. In rare cases where the aggregate itself is altered by heat, or where more refined measurement is required, the test should be conducted using a ventilated, controlled temperature oven.
- 4.2 Large particles of coarse aggregate, especially those larger than 2 in. (50 mm), will require greater time for the moisture to travel from the interior of the particle to the surface. The user of this test method should determine by trial if rapid drying methods provide sufficient accuracy for the intended use when drying large size particles.

5. APPARATUS

- 5.1 Balance — The balances shall have sufficient capacity, be readable to 0.1 percent of the sample mass, or better, and conform to the requirements of M 231.
- 5.2 Source of Heat — A ventilated oven capable of maintaining the temperature surrounding the sample at $110 \pm 5^{\circ}\text{C}$ ($230 \pm 9^{\circ}\text{F}$). Where close control of the temperature is not required (see Section 4.1), other suitable sources of heat may be used, such as an electric or gas hot plate, electric heat lamps, or a ventilated microwave oven.
- 5.3 Sample Container — A container not affected by the heat, and of sufficient volume to contain the sample without danger of spilling, and of such shape that the depth of sample will not exceed one fifth of the least lateral dimension.

- 5.3.1 Precaution — When a microwave oven is used, the container shall be nonmetallic.

Note 1: Except for testing large samples, an ordinary frying pan is suitable for use with a hot plate, or any shallow flat-bottomed metal pan is suitable with heat lamps or oven. Note Precaution in Section 5.3.1.

- 5.4 Stirrer — A metal spoon or spatula of convenient size.

6. SAMPLING

- 6.1 Sampling shall generally be accomplished in accordance with FOP for AASHTO T 2, except for the sample size may be as stated in Table 1.
- 6.2 Secure a sample of the aggregate representative of the moisture content in the supply being tested and having a mass not less than the amount listed in Table 1. Protect the sample against loss of moisture prior to determining the mass.

Nominal Maximum ^A		Minimum Mass ^B	
Size* in.	(mm)	lb	kg
US No. 4	(4.75)	1	0.5
¼	(6.3)	2	1
⅜	(9.5)	2	1
½	(12.5)	5	2
⅝	(16.0)	5	2
¾	(19.0)	7	3
1	(25.0)	13	6
1¼	(31.5)	17	7.5
1½	(37.5)	20	9
2	(50)	22	10
2½	(63)	27	12
3	(75)	33	15
3½	(90)	44	20
4	(100)	55	25
6	(150)	110	50

* For aggregate, the nominal maximum size, (NMS) is the largest standard sieve opening listed in the applicable specification, upon which any material is permitted to be retained. For concrete aggregate, NMS is the smallest standard sieve opening through which the entire amount of aggregate is permitted to pass.

Note: For an aggregate specification having a generally unrestrictive gradation (i. e. wide range of permissible upper sizes), where the source consistently fully passes a screen substantially smaller than the maximum specified size, the nominal maximum size, for the purpose of defining sampling and test specimen size requirements may be adjusted to the screen, found by experience to retain no more than 5% of the materials.

Note: When determining moisture content for T 99 samples, use approximately 100 grams, and approximately 500 grams for T 180 samples.

A Based on sieves with square openings.

B Determine the minimum sample mass for lightweight aggregate by multiplying the value listed by the dry-loose unit mass of the aggregate in kg/m³ (determined using T 19M/T 19) and dividing by 1600.

Sample Size for Aggregate

Table 1

7. PROCEDURE

- 7.1 Determine the mass of the sample to the nearest 0.1 percent or better of the total sample mass.
- 7.2 Dry the sample thoroughly in the sample container by means of the selected source of heat, exercising care to avoid loss of any particles. Very rapid heating may cause some particles to explode, resulting in loss of particles. Use a controlled temperature oven when excessive heat may alter the character of the aggregate, or where more precise measurement is required. If a source of heat other than the controlled temperature oven is used, stir the sample during drying to accelerate the operation and avoid localized overheating. When using a microwave oven, stirring of the sample is optional.
 - 7.2.1 Caution — When using a microwave oven, occasionally minerals are present in aggregates that may cause the material to overheat and explode. If this occurs it can damage the microwave oven.

7.3 When a hot plate is used, drying can be expedited by the following procedure. Add sufficient anhydrous denatured alcohol to cover the moist sample. Stir and allow suspended material to settle. Decant as much of the alcohol as possible without losing any of the sample. Ignite the remaining alcohol and allow it to burn off during drying over the hot plate.

7.3.1 Warning — Exercise care to control the ignition operation to prevent injury or damage from the burning alcohol.

7.4 The sample is thoroughly dry when further heating causes, or would cause, less than 0.1 percent additional loss in mass.

WSDOT NOTE: When weighing hot samples, use a heat sink to protect the balance.

7.5 Determine the mass of the dried sample to the nearest 0.1 percent or better of the total sample mass after it has to room temperature.

8. CALCULATION

8.1 Calculate total evaporable moisture content as follows:

$$p = \frac{100(W - D)}{D}$$

where:

p = total evaporable moisture content of sample, percent;
W = mass of original sample, g; and
D = mass of dried sample, g

8.2 Surface moisture content is equal to the difference between the total evaporated moisture content and the absorption, with all values based on the mass of a dry sample. Absorption may be determined in accordance with T 85, Test for Specific Gravity and Absorption of Coarse Aggregates, or T 84, Test for Specific Gravity and Absorption of Fine Aggregates

9. PRECISION AND BIAS

See AASHTO T 255 for Precision and Bias

10. REPORT

Report results using WSDOT Form 422-020 , or other report approved by the State Materials Engineer.

Performance Exam Checklist

Total Moisture Content of Aggregate by Drying FOP for AASHTO T 255

Participant Name _____ Exam Date _____

Procedure Element	Yes	No
1. The tester has a copy of the current procedure on hand?	<input type="checkbox"/>	<input type="checkbox"/>
2. All equipment is functioning according to the test procedure, and if required, has the current calibration/verification tags present?	<input type="checkbox"/>	<input type="checkbox"/>
3. Representative sample of appropriate mass obtained?	<input type="checkbox"/>	<input type="checkbox"/>
4. Mass of clean, dry container determined?	<input type="checkbox"/>	<input type="checkbox"/>
5. Sample placed in container and mass determined?	<input type="checkbox"/>	<input type="checkbox"/>
6. Test sample mass conforms to the required mass?	<input type="checkbox"/>	<input type="checkbox"/>
7. Sample mass determined to 0.1 percent?	<input type="checkbox"/>	<input type="checkbox"/>
8. Loss of moisture avoided prior to mass determination?	<input type="checkbox"/>	<input type="checkbox"/>
9. Sample dried by a suitable heat source?	<input type="checkbox"/>	<input type="checkbox"/>
10. Sample cooled prior to mass determination?	<input type="checkbox"/>	<input type="checkbox"/>
11. If aggregate heated by means other than a controlled oven, is sample stirred to avoid localized overheating?	<input type="checkbox"/>	<input type="checkbox"/>
12. Mass determined and compared to previous mass – showing less than 0.1 percent loss?	<input type="checkbox"/>	<input type="checkbox"/>
13. Calculations performed properly and results reported to the nearest 0.1 percent?	<input type="checkbox"/>	<input type="checkbox"/>

First attempt: Pass Fail

Second attempt: Pass Fail

Signature of Examiner _____

Comments:

