

Standard Method of Test for

Determining Moisture Content of Construction Materials by “Pan Drying” Method

SCDOT Designation: SC-T-23 (03/18)

1. SCOPE

- 1.1 This method covers a procedure for determining in the field the amount of moisture in a soil or fine aggregate by placing the material in a pan and drying the material over a low flame. The accuracy of the method depends upon the care exercised in conducting the test. Too little drying will reflect an inaccurately low moisture content, while excessive drying drives out the water combined in the clay molecules and organics, resulting in higher results than the true moisture content. Too fast a drying process with a high flame will sometimes cause sample particles to pop out of the pan and the result will also be higher than the true moisture content.
- 1.2 This standard may involve hazardous materials, operations and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. REFERENCED DOCUMENTS

- 2.1. None

3. SUMMARY OF TEST METHOD

- 3.1. The moisture content of a sample of soil is obtained by measuring the change in the mass of a sample of the soil prior to and after drying to a saturated surface dry condition over a heat source in an open pan.

4. SIGNIFICANCE AND USE

- 4.1 The moisture content of construction materials for use in roadway is important in determining compaction and proportioning of additional materials. The moisture content of a sample of soil or fine aggregate can be obtained in the field.

5. APPARATUS

- Heat Source: Electric Hot Plate or Gas Burner (& Lighter)
- CMUs or Heat Resistant Platform for Heat Source
- 2 Stackable Flat Bottom Metal Containers: Large Frying Pan or Similar Suitable to Hold Entire Sample
- Clean Dry Sand: Enough to Fully Cover the Bottom of a Pan to a Depth Which Allows the Bottom of the Second Stacked Pan to be Fully Supported
- Balance or Electronic Scale (& Towel or Mat to Protect Scale from Heated Containers)
- Stirring Tool: Trowel or Spoon
- Gloves
- Shovel and Pan or Bowl for Sampling
- Optional
 - Timer
 - Infrared Thermometer

6. TEST SPECIMENS

6.1 Sampling Location

- The specimen shall be obtained directly beneath the location of the nuclear gauge test for density and at the full depth of the specified layer.

6.2 Sample Size Requirements

6.2.1 Soils & Fine Aggregates

- A representative sample weighing approximately 500 to 600 grams

6.2.2 Coarse Aggregates

- A representative sample adhering to the following table;

Sample Sizes for Coarse Aggregates	
<i>Nominal Maximum Aggregate Size mm (in)</i>	<i>Minimum Sample Size grams (lbs)</i>
4.75 (No. 4)	500 (1.1)
9.5 (3/8)	1,500 (3.3)
12.5 (1/2)	2,000 (4.4)
19.0 (3/4)	3,000 (6.6)
25.0 (1.0)	4,000 (8.8)
37.5 (1.5)	6,000 (13.2)
50.0 (2.0)	8,000 (17.6)

Figure SC-T-23-A: Sample Sizes

6.2.3 CMRB

- A representative sample weighing approximately 2500 to 3000 grams.
- For surface moisture testing, the sample size should remain the same but the depth of the sample should remain in the top 2 inches.

7.0 PROCEDURE

- 7.1 Set up the heat source in a safe area. Begin drying/warming the sand. Set up the scale in a level area, avoiding excessive wind.
- 7.2 Weigh a clean, dry container. Record the weight (a).
- 7.3 Obtain a representative sample of material according to the guidelines given in the 'Test Specimens' section above.
- 7.4 Place the sample material in the container. Record the combined weight of the container and specimen (b).
- 7.5 Place the container on the heat source over a low heat setting. Take caution when heating the sample as overheating may breakdown organic material or oxidize material, causing the calculated moisture content to be inaccurate. To assist with overheating protection, a second container with sand shall be stacked beneath the container with the sample on the heat source to help in even heating of the sample.
- 7.6 Mix continuously using the trowel or spoon to expedite the drying process as well as prevent overheating of the specimen. Gradually break down lumps so they will dry fully. Take caution when stirring the sample not to lose any material.
- 7.7 When the specimen appears to be fully dried and no material is sticking to the stirring tool, remove it from the heat source and cool. Record the combined weight of the container and specimen (c1).
- 7.8 Place the container back on the heat source for approximately 2-3 minutes and stir continuously.
- 7.9 Again, remove the container from the heat source and cool. Record the combined weight of the container and specimen (c2).
- 7.10 If the weight has not changed more than 10 grams in consecutive readings, the sample is considered dry and the test procedure is complete. If the weight has decreased, repeat the previous two steps until consecutive readings have less than a 10 gram difference.

8.0 CALCULATIONS

8.1 The percent moisture in the material is computed as the difference in the wet and dry weights (moisture) divided by the final (dry) weight as follows;

a – Weight of Container

b – Combined Weight of Container & Specimen BEFORE Drying

c – Final Reading of Combined Weight of Container & Specimen AFTER Drying

$$\text{Moisture Content (\%)} = 100 * \frac{b - c}{c - a}$$

8.2 Example;

a	Weight of Empty Container	322.9 g
b	Combined Weight of Container & Specimen BEFORE Drying	3056.8 g
c	Combined Weight of Container & Specimen AFTER Drying	2856.7 g

$$\text{Moisture Content (\%)} = 100 * \frac{3056.8 - 2856.7}{2856.7 - 322.9} = 100 * 0.0789 = 7.9\%$$

9.0 REPORT

9.1 Report the moisture content in the sample to the nearest 0.1 percent on either;

- SCDOT Form 200.02 – Percent Compaction by Nuclear Gauge
- SCDOT Form 200.03 – Percent Compaction by Nuclear Gauge-Direct Read Gauge
- SCDOT Form 300.06 – Reclamation Percent Compaction By Nuclear Gauge – Direct Read