



**INDIANA DEPARTMENT OF TRANSPORTATION
DIVISION OF MATERIALS AND TESTS**

**DETERMINATION OF CALCIUM/MAGNESIUM CARBONATE
CONTENT IN SOILS USING SEQUENTIAL LOSS ON IGNITION TEST
ITM No. 507-21**

1.0 SCOPE.

- 1.1 This test method covers the procedure to determine the percentage of calcium carbonate (CaCO_3)/magnesium carbonate (MgCO_3) in soils using sequential Loss on Ignition (LOI) test.
- 1.2 This ITM may involve hazardous materials, operations and equipment and may not address all of the safety problems associated with the use of the test method. The user of ITM is responsible for establishing appropriate safety and health practice and determining the applicability of regulatory limitations prior to use.

2.0 REFERENCES.

2.1 AASHTO Standards.

- T 87 Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
- T 267 Determination of Organic Content in Soils by Loss on Ignition

3.0 TERMINOLOGY. Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101, and the AASHTO and ASTM Standards

4.0 SIGNIFICANCE AND USE. This ITM shall be used to determine the percentage of $\text{CaCO}_3/\text{MgCO}_3$ in silt-clay materials with greater than 35% passing the No. 200 sieve.

5.0 APPARATUS.

- 5.1 Oven, capable of maintaining temperatures of $230 \pm 9^\circ\text{F}$. Gravity, instead of blower convection, may be necessary when drying lightweight material.
- 5.2 Balance, Class G 1, in accordance with AASHTO M 231.
- 5.3 Muffle furnace, capable of maintaining a continuous temperature of $1472 \pm 18^\circ\text{F}$ and having a combustion chamber capable of accommodating the designated container and sample.
- 5.4 Sieve, No. 10.

- 5.5 Crucibles or evaporating dishes, high silica, alundrum, porcelain, or nickel of 30-50ml capacity or Coors porcelain evaporating dishes approximately 100 ml top diameter.
- 5.6 Desiccator, sufficient size containing an effective desiccant.
- 5.7 Containers, suitable rustproof metal, porcelain, or glass.
- 5.8 Miscellaneous supplies such as asbestos gloves, tongs, and spatulas.

6.0 SAMPLE PREPARATION.

- 6.1 Obtain a representative sample with a weight of at least 100 g from the thoroughly mixed portion of the soil passing the No. 10 sieve.
- 6.2 Place the sample in a container and dry in the oven at $230 \pm 9^{\circ}\text{F}$.
- 6.3 Weigh the sample and container after 15 minutes of drying. Continue drying the sample and reweigh at 5 minute intervals until constant weight is achieved (Note 1).

Note 1 – Constant weight is defined as the weight at which further drying does not alter the weight by more than 0.1 percent.

- 6.4 Remove the sample from the oven, place in the desiccator and allow to cool.

7.0 PROCEDURE.

- 7.1 Measure the weight of the crucible (W_1)
- 7.2 Place a dried soil sample of 10 to 40 grams inside the crucible
- 7.3 Measure the weight of the crucible and soil to the nearest 0.01g (W_2)
- 7.4 Place the crucible and soil into the muffle furnace at a temperature of $851 \pm 18^{\circ}\text{F}$ for 6 hours
- 7.5 Remove the crucible and soil from the furnace, place into a desiccator, and allow to cool
- 7.6 Remove the cooled sample from the desiccator and determine the weight of the crucible and soil to the nearest 0.01g (W_3)
- 7.7 Place the crucible and soil into the muffle furnace at $1472 \pm 18^{\circ}\text{F}$ for 6 additional hours

7.8 Remove the crucible and soil from the furnace, place into a desiccator, and allow to cool

7.9 Remove the cooled sample from the desiccator and determine the weight of the crucible and soil to the nearest 0.01g (W_4)

8.0 CALCULATIONS.

8.1 Calculate the percentage of calcium/magnesium carbonate to the nearest 1% as follows:

$$\% \text{CaCO}_3 / \text{Mg CO}_3 = 2.27 \times \frac{W_3 - W_4}{W_2 - W_1} \times 100$$

Where:

W_1 = Weight of crucible

W_2 = Weight of crucible and dried soil

W_3 = Weight of crucible and soil after ignition at $851 \pm 18^\circ\text{F}$

W_4 = Weight of crucible and soil after ignition at $1472 \pm 18^\circ\text{F}$

9.0 REPORT. The percentage of calcium/magnesium carbonate is reported to the nearest 1 percent.