



TEX-103-E

Determining Moisture Content in Soil Materials



Why

To determine the moisture (water) content of soil, rock, and soil-aggregate mixtures using a conventional oven or a microwave oven.



When

- Item 247
- Item 251
- Item 260
- Item 263
- Item 265
- Item 275
- Item 276
- Special Spec. 3088
- Special Spec. 3089
- Special Spec. 3095



How

Equipment

- Drying oven
- Microwave oven
- Balance
- Oven safe container with lid



- Microwave safe container with lid
- Gloves suitable for handling hot containers
- Desiccator cabinet, or jar, containing silica gel or anhydrous calcium sulfate
- Heat sink, for microwave oven



Preparations

- Sample in accordance with Tex-100-E for soil and Tex-400-A for aggregate.
- Store test sample in an airtight container at a temperature between 37°F and 86°F, do not store in direct sunlight.
- Select test specimen mass by the application, type of material, and type of sample. Always select a representative sample in all cases.
- Make moisture content determination as soon as practical after sampling.
- Bulk sampling test specimens should be gathered after thoroughly mixed and selected in accordance with Table 1.

Part I: Conventional Oven Method

Procedure

- Select test specimen mass using Table 1.
- Weigh and record the mass of a clean, dry container and lid.
- Place moist specimen in the container and secure the lid, weigh and record.
- Place container without lid in oven.
- Dry minimum of 16 hours.
- If drying large test samples, place material in container having a large surface area and spread-out test sample in smaller portions.
- After sample has dried to constant mass remove container from oven and place lid on firmly.
- Allow sample and container to cool to room temperature and weigh and record the mass.



Part II: Microwave Oven Method

Hazards

- Handle hot containers with insulated container holder, serious burns can result from improper handling.
- **Caution:** Drying soils containing metallic materials may cause arcing in the oven. Highly organic soils and those containing oils and coal may ignite and burn during drying.
- Do not use metallic containers in a microwave oven.
- The use of a microwave oven is acceptable in place of a $110 \pm 5^{\circ}\text{C}$ ($230 \pm 9^{\circ}\text{F}$) oven for drying soil specimens.



Procedure

- Weigh and record the mass of a clean, dry container and lid (not metallic).
- Place moist specimen in the container and secure the lid weigh and record.
- Place heat sink, soil and container, without lid, in microwave oven and run for 3 minutes.
 - Shorter or longer times can be used without overheating.
 - Three minutes is for a minimum mass of 100 g.
 - *Do not use a smaller samples size, as drying may be too rapid for proper control.*
- Weigh and record the mass of the container, lid, sample.
- Carefully mix the sample with a spatula, knife, glass rod.
- Return the sample and container in the oven for 1 minute.
- Repeat drying, cooling, and weighing, until constant mass is reached.



Action

1. Identify sample material being tested by boring number, sample number, test number, etc.
2. Moisture content of the sample to the nearest 0.1% or 1%, depending on the purpose of the test.
3. Indication of any test specimen having a mass less than the minimum mass.
4. Indicate containing more than one soil type (layered, etc.).
5. Indicate the method of drying, Part I or Part II.
6. Indicate any material (size and amount) excluded from the test specimen.
7. Time and setting of the initial drying period and subsequent incremental drying period when Part II is used.
8. Initial and final mass of sample.
9. Identification of the microwave oven and the drying settings and cycles used when standardized drying is used.