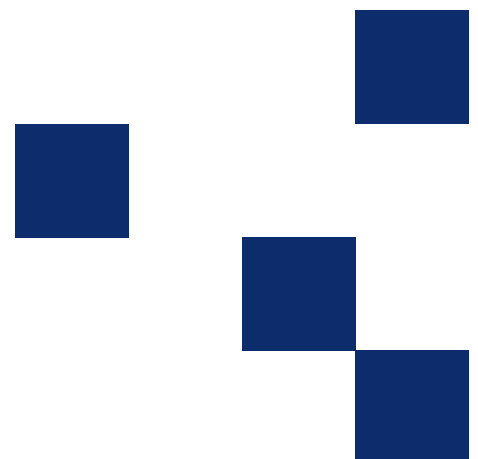




Test method T180

Moisture content of road construction materials (microwave oven method)

OCTOBER 2012



Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and Revision Summary Added. AS No. Revised	D. Dash	May 1999
Ed 2/Rev 0	All	Generally - revised-title changed.	G. Donald	Nov 2007
Ed 3/Rev 0	All. 2(a),(c),(d), (e)(i). 5(g). 6(b). 7(a), (b)	New issue. Clarify usage and correlation requirement. Reference added. Results to be corrected.	D Hazell	Oct 2011
Ed 4/ Rev 0	All	Reformatted RMS template	J Friedrich	October 2012

Note that Roads and Maritime Services is hereafter referred to as 'RMS'.

The most recent revision to Test method T180 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T180

Moisture content of road construction materials (microwave oven method)

1. Scope

This test method sets out the standard method for the determination of the moisture content of road construction materials as a percentage of its dry mass using a microwave oven.

2. General

- (a) This method is an option for the determination of moisture content. However, it must not be used when material contains a significant proportion of minerals with crystalline water (e.g. gypsum) or organic matter. Use T120 for such material
- (b) The material must be free of any metal particles
- (c) This subsidiary method must be correlated with T120 in accordance with T2105
- (d) Following this test, the portion must not be used for other testing
- (e) The following documents are referred to in this test method:
 - (i) T105 Preparation of Samples for Testing (Soils)
 - (ii) T2105 Correlation of Moisture Content with Standard Method

3. Apparatus

- (a) Microwave oven

NOTE: Microwave ovens with temperature control may need to be calibrated to provide temperature control less than 80°C or in the range 105°C to 110°C, comparable with a conventional oven. However, the time taken to dry samples may be so long as to prevent the test being considered a rapid method.

Never operate the microwave oven without a load. Ensure the interior and door seals are kept clean.

- (b) Heat-resistant, non-absorbent, non-metallic containers
- (c) Perforated cover of non-metallic and heat-resistant material for the containers
- (d) A balance of suitable capacity with a limit of performance of not greater than ± 5 g
- (e) Scoops, spatula, tongs, etc

4. Preparation

Samples shall be prepared in accordance with T105.

5. Procedure

- (a) Determine the mass of a clean dry container and record the mass (M_1) in grams
- (b) Place the sample in the container and determine the mass of the container and moist sample (M_2)

NOTE: For coarse grained materials, the use of more than one container might be necessary to accommodate the mass of the test sample.

- (c) Place the container and contents in the microwave oven. Cover the contents with a perforated lid

NOTE: The moist sample may be initially crumbled to assist drying. Do not lose any material.

Microwave heating can violently crack stones and cause exploding material. The cover is to retain particles.

- (i) Select and set a suitable energy setting on the microwave oven

NOTE: Soils with a high moisture content may require a low energy setting when drying in an microwave oven without temperature control. This allows steady loss of moisture without boiling and ejection of particles (in the case of sands) or violent disintegration of lumps (in the case of clays). A lower energy level increases the drying time.

- (ii) Select and set a suitable drying period on the timer of the microwave oven
- (d) Where the microwave oven is fitted with a temperature control probe, insert the probe into the test sample and set the temperature control in the range 105°C to 110°C. Turn on the microwave oven

NOTE: The drying period will vary with the type of material, the size of the sample, and its moisture content and the energy setting on the microwave oven. Care is required to avoid overheating the sample without temperature control. For most aggregates, 20 minutes should be the maximum drying period in a microwave oven without temperature control.

- (e) Allow an initial drying period
 - (i) Remove the container, sample and cover from the microwave oven, remove the cover and allow to stand until cool to touch
 - (ii) Determine the mass of the container and sample, calculate the moisture content and record
 - (iii) Replace the cover and return the container, sample and cover to the microwave oven for a period of at least 2 minutes

NOTE: Care must be taken if removing a cover or temperature probe from the specimen to ensure that any adhering material is returned to the sample.

- (f) Drying to Constant Mass:
 - (i) Remove the container, sample and cover from the microwave oven, remove the cover and allow to stand until cool to touch.
 - (ii) Determine the mass of the container and sample, calculate the moisture content and record
 - (iii) Compare successive moisture contents. Constant Mass (M_3) has been achieved if the moisture contents from successive determinations are within 0.1%
 - (iv) Otherwise return the container, sample and cover to the microwave oven for a further period of at least 2 minutes and repeat Step (f)

NOTE: Reheating the sample for successive mass determinations may be carried out at higher energy settings than the initial setting.

The material may need to be covered or placed in a desiccator while cooling to prevent take up of moisture from the atmosphere.

- (g) Use the correlation determined in T2105 to calculate the corrected moisture content using results to the nearest 0.1%

6. Calculations

- (a) Calculate the uncorrected moisture content (w_u) of the sample as a percentage of the dry mass of the sample as follows:

$$w_u = \frac{(M_2 - M_3)}{(M_3 - M_1)} \times 100\%$$

Where:

w_u = Uncorrected moisture content (%)

M_1 = Mass of container (g)

M_2 = Mass of container and moist sample (g)

M_3 = Mass of container and dry sample at constant mass (g)

- (b) Calculate the corrected moisture content (w) of the sample based on the correlation from T2105 as follows:

$$w = A + (B \times w_u)$$

w = Corrected moisture content (%)

A = Correlation intercept from T2105

B = Correlation gradient from T2105

7. Reporting

Include the following data and results in the report:

- (a) The uncorrected moisture content (w_u) of the sample to the nearest 0.1%
- (b) The corrected moisture content to the nearest 0.5%

NOTE: Where the result is to be used in subsequent calculations, report the moisture content to the nearest 0.1%.

- (c) Reference to this test method