

Test Method

Determination of Aggregate Moisture Content and Estimated Free Water (Using Microwave or Hot Plate)

RC 253.01

1. Scope

This method describes the procedure for the estimation of the moisture content and free water content of an aggregate stockpile in use at a concrete plant, by means of the microwave oven drying method.

Note: This method is regarded as a subsidiary method and a correlation should be established against a standard oven method.

2. Apparatus

- Microwave oven, of a minimum 500 watt output, or a heating device such as an electric frying pan or hot plate
- Moisture content containers of suitably heat resistant glass or porcelain (see note a), equipped with a stopper or lid, if appropriate.
- Perforated cellulose plate, of approximately 150 mm square, if required (see note b).
- Balance of at least 2kg capacity reading to 1 g or better with a limit of performance of less than or equal to 5g.
- Scoop, tongs, spatula.

3. Procedure

- Obtain a test sample in accordance with Test Method AS 1141.3.1.
- By splitting or quartering obtain a suitable size in accordance with Table 1.

- Undertake any prescribed safety checks prior to using the microwave oven
Note: Safety checks may be nominated by the oven manufacturer
- It may be necessary, to allow the oven or hot plate to warm up prior to use.
- Determine the mass (m_1) of one or more clean dry container(s) (see note c).
- Place the test portion in the container and replace the stopper or lid, if appropriate.
- Determine the mass (m_2) of the container and contents
- Remove the stopper or lid, and place the container and contents in the microwave oven (see note d), or on the hot plate.
- Select a suitable drying period (Note d) and set it on the timer of the oven. Turn on the oven (Note f) or hot plate and dry the sample.
- Remove the container and contents from the oven or hot plate and allow to cool until the container is warm to touch, and/or place in dessiccator.
- Determine the mass (m_3) of the container and contents
- Continue to perform operations as described in steps (h), (i) and (j) until the difference between successive determinations of the mass of the cooled sample is less than 0.1 % of the original mass of the test portion.

Table 1 – Test sample mass

Nominal Aggregate Size (mm)	Minimum Mass of Test Portion
< 7	400 g
≥ 7	2 kg

4. Calculations

- (a) Calculate the moisture content as a percentage of the dry aggregate mass using the equation:

$$w = 100 \times \frac{(m2 - m3)}{(m3 - m1)}$$

where: w = moisture content as a percentage of the dry aggregate mass

m1 = mass of container in grams

m2 = mass of container plus wet aggregate mass in grams

m3 = mass of container plus dry aggregate mass in grams

- (b) Calculate the free water content (FW) as a percentage of the dry aggregate mass using the equation:

$$FW = w - WA$$

Note: Water absorption value of the aggregate (WA) may be determined by AS 1141.6.1 or AS 1141.6.2, or as designated in the mix design.

5. Reporting

Report the moisture content of the aggregate to the nearest 1 percent.

Report the moisture content of the aggregate to the nearest 1 percent, and the source of the water absorption value of the aggregate.

6. Notes:

- (a) Porcelain containers are more efficient than glass containers.

Note: Metal containers must not be used in the microwave oven as they are likely to damage its magnetron.

- (b) In the oven consider the use of 230 x 7mm Hardiplank, or similar product - cut into 150mm squares and then perforated with numerous 5 to 8mm diameter holes.
- (c) The use of more than one container may be necessary to satisfy the minimum mass requirement of the test portion.
- (d) The action of microwave heating may crack stones and occasionally may cause ejection of material from the container. Covering the container with a perforated cellulose plate can overcome the ejection problem.
- (e) Drying times will vary depending on the type and mass of the test portion, eg 400g of aggregate may take about twenty minutes in the oven or ten minutes on the hot plate.
- (f) The microwave oven must never be operated without load and the door interior and door seals should be kept clean at all times.

Test Method - Revision Summary

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Date	Clause Number	Description of Revision	Authorised by
June 2013	Full document	Re-styled with minor corrections made : Sub-clauses re-numbered, & Added reporting for FW	Manager – Construction Materials