Test Method

Determination Of The Cement Content Of Portland Cement Concrete

RC 352.02

1. Scope

This method is used to monitor the cement content of freshly mixed Portland cement concrete made in the field. It is suitable for concrete mixes of known proportions containing 200 to 500 kg of cement per cubic metre of concrete.

2. Apparatus and Materials

(a) A balance of adequate capacity with a limit of performance not exceeding ± 50 g.

(b) Splitter of chute size appropriate to the mix design

(c) 10-15 cm mouth scoop.

(d) Square-mouth shovel.

(e) Measuring cylinder - 1 litre minimum.

(f) Thermometer - 0°C-50°C, with graduations 0.2°C or less.

(g) A suitable vessel to contain the sample and permit its agitation with buffer solution.

(h) NOTE: For samples incorporating large maximum size aggregate it is essential that some mechanical means of agitation be available.

(i) Work sheets and graph paper

(j) Buffered acetic acid solution: 240 g of Tech. grade glacial acetic acid mixed with 250 g anhydrous sodium acetate (Tech. grade) per litre of solution.

(k) A suitable container for the storage of the diluted buffer solution.

3. Procedure

3.1. Calibration

(a) Measure out and mix together 1 litre of buffer solution and 1 litre of water for each 1 kg of the wet sample.

(b) Determine the proportions of the concrete mix under consideration and weigh out sufficient mass of each component into a mixing bowl, making allowance for moisture contained in the aggregate, to provide a sample of mass, according to the nominal maximum size of the concrete, not less than that given in Table 1. Mix the components thoroughly for two minutes.

Table 1

Nominal Maximum size of Concrete mm	Mass of Sample kg
20	2
14	1.5
10	0.8

(c) Measure the temperature of the mix (T_1).

(d) If necessary, adjust the temperature of the buffer solution until the difference between the temperature of the mix and that of the buffer solution is less than 3°C.

(e) Measure the temperature of the diluted buffer solution (T_2).

(f) Calculate a weighted average initial temperature of the buffer solution and sample, thus:-

$$T = \frac{T_1 + 2T_2}{3}$$

(g) Add the diluted buffer solution to the concrete sample.

(h) Agitate the sample vigorously for five minutes, ensuring that there is full movement of the solids in the container.

(i) Measure the temperature of the sample (T_3). It may take up to 2 minutes for the temperature to stabilise.

(j) Calculate the rise in temperature (ΔT) from the formula

$$\Delta T = T_3 - T$$

(k) Repeat Steps 3.1 (a) to 3.1 (j) inclusive for four further samples for cement contents ±1% and ± 2% from the design cement content.

(l) Draw a graph of temperature rise versus cement content of the dry mix.

3.2. Determination of Cement Content

(a) Draw a sample of the mixed concrete, according to the nominal maximum size of the concrete as shown in Table 1.

(b) Proceed as in Steps 3.1 (b) to 3.1 (j) inclusive to determine the rise in temperature accompanying neutralization with buffered acetic acid, using the same container used in the calibration procedure.

(c) Read from the graph the cement content of the concrete.

4. Reporting

Report the value found in 3.2 (c) as a percentage by mass of cement in the dry mix to the nearest 0.5 percent.

Test Method - Revision Summary

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Date	Clause Number	Description of Revision	Authorised by
June 2012	Full document	Re-styled with minor corrections made	Principal Advisor – Pavements & Materials