

RC 911.01

Manual of Testing

DETERMINATION OF THE VOLUME OF A CYLINDRICAL MOULD USING WATER

1. SCOPE

This method describes the procedures for determining the volume of a cylindrical metal mould by filling with water and weighing (see Note 1).

2. APPARATUS

- (a) Balance of appropriate capacity with a limit of performance not exceeding $\pm 0.5\text{g}$.
- (b) Glass plate capable of completely covering the mould.
- (c) Grease for forming watertight seal.
- (d) Thermometer readable and accurate to 0.5°C .
- (e) Clean potable water (preferably distilled).
- (f) Worksheet.

3. PROCEDURE

- (a) Record the laboratory identification of the mould and the date of calibration.
- (b) Clean and deburr the mould and baseplate.
- (c) Lightly grease the top and bottom of the mould to ensure water-tight seal.
- (d) Weigh the baseplate, mould and the glass plate and record in grams as mass "X".
- (e) Fill the mould with water. Remove any bubbles adhering to the sides or bottom of the mould using a stirring rod or piece of wire.
- (f) Slide the glass plate across the top of the mould so that there are no bubbles under the glass or adhering to the mould. Remove any water from the outside of the mould with a absorbent cloth or towel.
- (g) Top up as required.
- (h) Weigh the baseplate, mould, glass plate and water and record in grams as mass "Y".

- (i) Measure and record the temperature of the water.

- (j) Clean and dry the mould, base plate and glass plate Repeat steps (b) to (i) a further two times.

4. CALCULATIONS

- (a) For each determination calculate mass of water, Y-X.
- (b) Determine the correction factors Z for water temperature used from Table 1.
- (c) Calculate volume of mould in millilitres, corrected to 20°C as:

$$\text{Volume of Mould} = (Y - X) * \left(\frac{Z}{1000} + 1 \right)$$

where Z is the temperature correction factor as detailed in Table 1.

- (d) Calculate mean volume of mould as mean of the three determinations.

5. REPORTING

Maintain a copy of the worksheet in the laboratory.

NOTE

Note 1

If the mould and water are not at the same temperature, time should be allowed for the temperature to stabilise.

Table 1

Temp °C	Factor Z/1000g water	Temp °C	Factor Z/1000g water
15.0	2.14	22.5	3.30
15.5	2.20	23.0	3.40
16.0	2.26	23.5	3.50
16.5	2.32	24.0	3.60
17.0	2.39	24.5	3.70
17.5	2.46	25.0	3.81
18.0	2.53	25.5	3.92
18.5	2.61	26.0	4.04
19.0	2.68	26.5	4.14
19.5	2.77	27.0	4.27
20.0	2.85	27.5	4.38
20.5	2.93	28.0	4.51
21.0	3.02	28.5	4.63
21.5	3.12	29.0	4.76
22.0	3.20	29.5	4.88
		30.0	5.02

These values include corrections for:

- (a) the change in water density for temperature;
- (b) the change in the mould volume with temperature;
- (c) the change in the upthrust correction when using a balance that has been calibrated with masses of density of 8000 kg/m³ to determine the mass of the water.