
International Standard



6275

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Concrete, hardened — Determination of density

Béton durci — Détermination de la masse volumique

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Descriptors : concrete, hardened concrete, tests, determination, density.

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 6275 was developed by Technical Committee ISO/TC 71, *Concrete, reinforced concrete and pre-stressed concrete*, and was circulated to the member bodies in May 1979.

It has been approved by the member bodies of the following countries:

Australia	India	South Africa, Rep. of
Austria	Israel	Spain
Belgium	Italy	Sweden
Bulgaria	Korea, Rep. of	Switzerland
Canada	Libyan Arab Jamahiriya	United Kingdom
China	Netherlands	USA
Czechoslovakia	New Zealand	USSR
Denmark	Norway	Yugoslavia
Egypt, Arab Rep. of	Poland	
Germany, F. R.	Romania	

The member body of the following country expressed disapproval of the document on technical grounds :

France

Concrete, hardened – Determination of density

1 Scope and field of application

This International Standard specifies a method of determining the density of hardened concrete. It is applicable to lightweight, normal weight and heavy weight concrete in the following conditions :

- a) as-received;
- b) saturated;
- c) oven dried.

2 Definition

For the purpose of this International Standard, the following definition applies.

density : The ratio of the mass of a given quantity of hardened concrete to its volume, expressed in kilograms per cubic metre.

3 Sampling

The volume of the sample shall be not less than $50 d^3$, where d is the nominal maximum size of the aggregate. In no case shall the volume be less than $0,001 \text{ m}^3$.

The entire sample as received shall normally be used for the determination. If, however, the shape or size of a sample is such that it is not possible to use all of it, a smaller sample may be sawn from the original.

4 Apparatus

4.1 Ventilated oven (if the determination is to be made on oven-dried concrete), capable of being controlled at $105 \pm 5 \text{ }^\circ\text{C}$.

4.2 Balance, equipped with a specimen-bearing stirrup for weighing the sample in water to an accuracy of 0,10 %.

4.3 Water tank (if the determination is to be made on a specimen of irregular shape), of adequate dimensions for immersing and handling the sample, and fitted with a device to maintain the water level constant.

5 Procedure

5.1 Determination of mass of the sample

5.1.1 Mass of as-received sample

Weigh the as-received sample and record its mass (m_0).

5.1.2 Mass of saturated sample

Immerse the sample in water at $20 \pm 2 \text{ }^\circ\text{C}$ until no further increase in mass is observed.

This is considered to have been achieved when two measurements, 24 h apart, show a difference of less than 0,2 % in the mass of the wet sample. Before weighing, dry the sample using a moist cloth so as to remove surface water. Record the mass of the sample (m_1).

5.1.3 Mass of oven-dried and cooled sample

Dry the sample in the oven (4.1) at $105 \pm 5 \text{ }^\circ\text{C}$ until no further decrease in mass is observed.

This is considered to have been achieved when two measurements, 24 h apart, show a difference of less than 0,2 % in the mass of the dry sample. Record the mass of the sample (m_2).

5.2 Determination of the volume of the sample

5.2.1 Determination by displacement

If the sample is of irregular shape, determine its volume after saturation by weighing in water at $20 \pm 2 \text{ }^\circ\text{C}$ ¹⁾.

1) The case of no-fines concrete, lightweight aggregate concrete with large pores, or samples the moisture content of which is not to be altered (which requires application of an impermeable layer) is not considered here.

Allow the hydrostatic device of the balance (4.2) to reach equilibrium, ensuring that the empty stirrup, hanging from it, is completely immersed in the water tank (4.3). Immerse the stirrup to the same depth when making weighings with or without the sample. Place the saturated sample on the stirrup with the whole device completely immersed in the water tank.

Avoid trapping air bubbles on the sides of the sample. Record the mass of the sample, m_3 , when oscillation of the hydrostatic balance has ceased.

The volume, V , of the sample is given by the formula

$$V = \frac{m_1 - m_3}{\rho_w}$$

where ρ_w is the density of water (temperature and pressure corrections can be neglected).

5.2.2 Determination by calculation

If the as-received sample or the prepared sample is sufficiently large and of simple and regular shape so that its dimensions can be determined with an accuracy of 0,2 %, the volume may be calculated directly from these dimensions.¹⁾

6 Calculation and expression of results

6.1 Density of as-received sample

The density, ρ_0 , of the as-received sample, expressed in kilograms per cubic metre, is given by the formula

$$\rho_0 = \frac{m_0}{V}$$

where

m_0 is the mass, in kilograms, of the as-received sample;

V is the volume, in cubic metres, of the as-received sample.

6.2 Density of saturated sample

The density, ρ_1 , of the saturated sample, expressed in kilograms per cubic metre, is given by the formula

$$\rho_1 = \frac{m_1}{V}$$

where

m_1 is the mass, in kilograms, of the saturated sample;

V is the volume, in cubic metres, of the saturated sample.

6.3 Density of oven-dried sample

The density, ρ_2 , of the oven-dried sample, expressed in kilograms per cubic metre, is given by the formula

$$\rho_2 = \frac{m_2}{V}$$

where

m_2 is the mass, in kilograms, of the oven-dried sample;

V is the volume, in cubic metres, of the oven-dried sample.

6.4 Expression of results

Report the density of each sample to the nearest 10 kg/m³.

7 Test report

The test report shall include the following information :

- a reference to this International Standard;
- the results obtained;
- identification of the concrete;
- the shape of the sample (dimensions, mass, etc.);
- whether the sample was tested as-received or after sawing;
- whether the volume was determined by displacement, or by calculation;
- the condition at the time of testing (sample as-received, saturated or oven-dried);
- the date of test.

1) For routine testing it is sufficient to apply the methods specified in ISO 4012, *Concrete — Determination of compressive strength of test specimens*, and ISO 4013, *Concrete — Determination of flexural strength of test specimens*.