British Standard

BRITISH STANDARD

BS 1881-111: 1983

Incorporating Amendment No. 1 and implementing Amendment No. 2 not published separately

Testing concrete —

Part 111: Method of normal curing of test specimens (20 °C method)

Committees responsible for this British Standard

This British Standard was published under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Committee CAB/–. Its preparation was entrusted to Technical Committee CAB/4 upon which the following bodies were represented:

British Aggregate Construction Materials Industries
British Precast Concrete Federation Ltd.
British Ready Mixed Concrete Association
Cement Admixtures Association
Cement and Concrete Association
Cement Makers' Federation
Concrete Society Limited
County Surveyors' Society
Department of the Environment (Building Research Establishment)
Department of the Environment (PSA)
Department of the Environment (Transport and Road Research Laboratory)
Department of Transport
Electricity Supply Industry in England and Wales
Federation of Civil Engineering Contractors
Greater London Council
Institute of Concrete Technology
Institution of Civil Engineers
Institution of Highway Engineers
Institution of Municipal Engineers
Institution of Structural Engineers
Institution of Water Engineers and Scientists
National Federation of Building Trades Employers
Royal Institute of British Architects
Royal Institution of Chartered Surveyors
Sand and Gravel Association Limited
Society of Chemical Industry

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Civil Engineering Test Equipment Manufacturers' Association
Coopted members

This British Standard, having been prepared under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Committee, was published under the authority of the Board of BSI and comes into effect on 29 July 1983

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Amendments issued since publication

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Contents

Foreword

This Part of this British Standard, prepared under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Committee, is a revision of **2.5**, **2.6**, **4.5**, **4.6**, **5.6**, and **5.7** of BS 1881-3:1970. Together with Parts 108, 109, 110, 112 and 113, this Part of BS 1881 supersedes BS 1881-3:1970, which is withdrawn.

This Part describes the method of normal curing of cubes, beams and cylinders at 20 °C. Methods for accelerated curing of cubes are given in BS 1881-112 and the method for curing no-fines cubes is given in BS 1881-113. The distinction between specimens cured in the laboratory and on site, included in the 1970 edition, has been removed.

For the control of temperature conditions in testing laboratories situated in tropical climates a mid point of 27 °C has been internationally recommended. When tests specified in this standard are carried out in such climates, therefore, it is suggested that a temperature mid point of 27 °C should be adopted, subject to the same tolerances as those laid down in the relevant clauses of the standard for use in temperate climates, and the fact reported.

If mist curing of concrete strength test specimens is to be used as an alternative to the method given in this Part, it is essential that the method used can be shown to give equivalent results to those obtained from testing tank cured specimens. The method of mist curing used should be based on curing in an atmosphere with a relative humidity of over 95 %.

NOTE The high humidity required in moist air curing rooms is normally produced by spraying water as a fine aerosol. The bacterium *Legionella pneumophila* is widespread in nature and is present in the water systems of many buildings. Scale in pipework and chemical nutrients in the water supply may encourage growth of this organism which multiplies between 20 °C and about 45 °C. Inhaling infected aerosols is a known route for the transmission of Legionnaires' disease. It is therefore advisable to maintain cold water supplies below 20 °C where possible and to store hot water above 60 °C. Cold water supplies may be disinfected by chlorination to at least 5 mg/L free chlorine. Regular periodic checking for the presence of *Legionella* species in industrial water supplues is a sensible precaution.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 and 2, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of this British Standard describes the method of normal curing of concrete specimens (cubes, beams or cylinders made in accordance with Parts 108, 109 and 110 of this British Standard) at 20 °C for strength tests at ages of 1 day and over.

NOTE This titles of the publications referred to in this standard are listed on the inside back page.

2 Definitions

For the purposes of this Part of this British Standard, the definitions given in BS 5328 and BS 1881-101 apply.

3 Apparatus

3.1 *Curing tank.* A curing tank constructed from any material which is of adequate strength and will resist corrosion. The internal dimensions of the tank shall be appropriate for the number and size of the specimens to be accommodated, shall permit adequate circulation of water and shall be such that specimens can be easily removed.

Domestic supply water shall be used for filling the tank and for occasional topping up to maintain a reasonably constant water level. At any point in the tank where specimens are stored the temperature shall be 20 ± 2 °C.

NOTE 1 In order to achieve this temperature control it may be necessary to provide the tank with a lid and/or a water cooling system in addition to the water heating system.

NOTE 2 When handling cubes in curing tanks, protective gloves should be worn.

3.2 *Thermometer,* suitable for measuring maximum and minimum moist air and water curing temperatures.

4 Procedure

Immediately after making specimens (see BS 1881-108, 109 or 110 as appropriate) store them in a place free from vibration and in conditions which will prevent loss of moisture. If it is necessary to move the specimens to the place of storage, move them in their moulds ensuring no loss of concrete. Store the specimens either:

a) in an atmosphere with a relative humidity of not less than 90 % in a moist air curing room or a cabinet; or

b) under damp matting or any other suitable damp material wrapped completely with polyethylene or other impervious sheeting.

NOTE The preferred method for storing specimens is that described in a).

Whichever method of moist air storage is used, maintain the temperature of the specimens at 20 ± 5 °C if the specimens are to be tested at an age of 7 days or more, or at 20 ± 2 °C if the specimens are to be tested at an earlier age.

Demould specimens to be tested at 24 h just before testing. Demould specimens to be tested at greater ages within the period 16 h to 28 h after the addition of water to the other constituents in the mix unless the concrete has not achieved sufficient strength to enable specimens to be demoulded during this period. In such cases, delay demoulding for a further 24 h. During this further period, continue the storage of the specimens in the moist air conditions.

Mark each specimen clearly and indelibly with an identification number or code. Unless required for test at 24 h, either submerge the specimens immediately in the curing tank or immediately prepare them for transporting to another location. Keep all specimens which are immediately transferred to the curing tank submerged and remove them just before testing unless it is necessary to transport them to another location for testing.

Immediately after removal from the moulds or from the curing tank, pack specimens to be transported in such a way as to prevent any significant change in moisture content.

NOTE This may be achieved by using special boxes having compartments lined with wet felt or other suitable material.

After filling, seal each box or enclose it in polyethylene. Alternatively, the specimens may be packed in damp sand or in wet sacks and enclose in a polyethylene bag. Store the transported specimens in the curing tank for not less than 24 h before the time of testing. This transfer of specimens may take place at any time between demoulding of the specimens and 24 h before the time of testing but it shall be effected in as short a time as is practicable. In order to provide adequate circulation of water and to facilitate the removal of the specimens from the curing tank ensure that there is at least 15 mm of water horizontally between specimens and between specimens and the sides of the tank. Continue the curing in water as long as possible up to the time of testing.

Record the daily maximum and minimum moist air and water curing temperatures using either maximum and minimum thermometers or continuous recording instruments.

5 Age of test specimens

Tests shall be carried out within the following tolerances on the ages for testing.

± 30 min for ages up to and including 30 h

± 2 h for ages above 30 h and up to and including 100 h

± 8 h for ages above 100 h and up to and including 60 days

± 1 day for ages above 60 days.

The ages shall be calculated from the time of adding the water to the other materials in the concrete mix.

NOTE 1 Preferred ages for testing are 1, 2, 3, 7, 14 and 28 days, 13 and 26 weeks and 1 year.
NOTE 2 If the test results are used to compare the performance of different testing machines closer tolerances may be appropriate.

6 Report

6.1 General. The report shall affirm that the specimens were cured in accordance with this Part of this British Standard. The report shall state whether or not a certificate of sampling and specimen preparation is available. If available, a copy of the certificate shall be provided.

6.2 Information to be included in the report

6.2.1 *Mandatory information.* The following information shall be included in the test report:

a) identification number or codes of specimens;

b) location of moist air curing;

c) method of moist air curing;

d) period of moist air curing;

e) maximum and minimum moist air and water curing temperatures;

f) certificate that curing has been carried out in accordance with this Part of this standard.

6.2.2 *Optional information.* If requested the following information shall be included in the test report:

a) time of adding the water to the other materials in the concrete mix;

b) time of making specimens;

c) time of immersion of specimens in curing tank(s), if applicable;

d) time of removal of specimens from curing tank(s), if applicable;

e) temperature record during moist air curing;

f) temperature record during water curing;

g) age(s) at which specimens are to be tested.

Publications referred to

BS 1881, *Testing concrete.*
BS 1881-101, *Method of sampling fresh concrete on site.*
BS 1881-108, *Method for making test cubes out of fresh concrete.*
BS 1881-109, *Method for making test beams out of fresh concrete.*
BS 1881-110, *Method for making test cylinders out of fresh concrete.*
BS 1881-112, *Methods of accelerated curing of test cubes*[1)].
BS 1881-113, *Method of making and curing no-fines test cubes*[1)].
BS 5328, *Methods for specifying concrete, including ready-mixed concrete.*

[1)] Referred to in the foreword only.

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BSI
389 Chiswick High Road
London
W4 4AL