British Standard

BRITISH STANDARD

BS 1881-109: 1983

Incorporating Amendment No.1

Testing concrete —

Part 109: Method for making test beams from fresh concrete

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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

The following BSI references relate to the work on this standard:
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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 **4.1, 4.2, 4.3, 4.4, 4.7** and **4.8** of BS 1881-3:1970. Together with Parts 108, 110, 111, 112 and 113, this Part of BS 1881 supersedes BS 1881-3:1970, Which is withdrawn.

The dimensions and tolerances specified in this Part of this standard comply with ISO 1920.

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 to 4, 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 a method for making test beams of nominal sizes 150 mm × 150 mm × 750 mm long and 100 mm × 100 mm × 500 mm long out of fresh concrete. The method applies to plain and air-entrained concrete made with lightweight, normal weight and heavy aggregates having a nominal maximum size not exceeding 20 mm for 100 mm × 100 mm × 500 mm long beams and 40 mm for 150 mm × 150 mm × 750 mm long beams.

This method does not apply to aerated concrete, very stiff concrete, which cannot be compacted by vibration alone, and no-fines concrete.

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

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 *Mould*

3.1.1 *Construction and assembly*. The sides and ends of the mould shall be manufactured from ferrous metal having a hardness value of at least 90 Rockwell (scale B) when determined in accordance with BS 891. The mould shall include a removable ferrous metal base plate. All parts of the mould shall be robust enough to prevent distortion. Before assembly for use, the joints between the sides and ends of the mould and between the sides and the base plate shall be thinly coated with oil or grease to prevent loss of water. The sides and ends of the mould when assembled shall be positively located and the whole assembly rigidly held together in such a manner as to prevent leakage from the mould. The internal faces of the assembled mould shall be thinly coated with release agent to prevent adhesion of the concrete.

The sides and ends of the mould shall be clearly marked before use with a reference code to enable each mould to be correctly assembled and, where appropriate, the beam to be marked for identification.

3.1.2 *Tolerances on dimensional deviations of new or refurbished moulds*. A new or refurbished mould shall be accurate within the following limits.

a) *Dimensions*. The internal depth and width of the mould when assembled, each based on the mean of six measurements symmetrically placed along the axis of the mould, shall be either 100 ± 0.15 mm or 150 ± 0.15 mm.

b) *Flatness*. Excluding any indentations resulting from the hardness test, the flatness tolerances (see BS 308-3) for each internal side face when assembled shall be 0.03 mm wide over any length equal to the depth of the mould and 0.3 mm wide for the whole length of the mould. The flatness tolerance for the end faces shall be 0.03 mm wide and for the joint faces, for the bottom surface of the assembled mould sides and ends and for the top surface of the base plate shall be 0.06 mm wide over any length equal to the depth of the mould and 0.6 mm over the whole length of the mould.

NOTE The flatness tolerances can be checked by using a straightedge complying with grade A of BS 5204-2 and feeler gauges complying with BS 957.

c) *Squareness*. When assembled, the squareness tolerances (squareness 4 of BS 308-3) for each internal side face with respect to both end faces and the top of the base plate as datum faces shall be 0.5 mm wide.

d) *Parallelism*. When assembled, the parallelism tolerance (parallelism 4 of BS 308-3) for the top surface of the mould with respect to the top surface of the base plate as datum face shall be 1.0 mm wide.

3.1.3 *Tolerances on dimensions and flatness of moulds in use*. A mould shall be refurbished or discarded when any dimensional deviation given in **3.1.2** exceeds twice the tolerance specified for a new mould.

NOTE Compliance with the tolerances on dimensions and flatness applicable to moulds in use should be checked at least once a year and when there is any cause to suspect that the dimensions of the mould may not be within the specified limits.

The flatness over the full length of the side face can be checked using a straightedge complying with grade A of BS 5204-2 and feeler gauges complying with BS 957.

The flatness for any length of each internal face equal to the depth of the mould can be checked by a similar method or by use of an assembly comprising two fixed reference points and a central movable reference point, all three of which can be placed in contact with the surface. The central reference point should be linked to a calibrated dial gauge, complying with BS 907, which indicates the distance of the third point from the line joining the two fixed reference points.

Checks on the flatness should be made in several directions on the unassembled individual parts and on assembled sides to ensure that the flatness is within the required tolerance in any direction everywhere along the length of the mould.

If the dial gauge assembly is used, suitable spacings between the fixed reference points are 80 mm and 120 mm for 100 mm and 150 mm moulds respectively. In such cases the flatness requirement of 0.06 mm for the internal side faces and ends of moulds in use is equivalent to a deviation of the movable reference points from the line joining the two fixed reference points of 0.04 mm.

The corresponding value when using a dial gauge assembly to check the flatness of joint faces or of the top surface of the base plate over any length up to the depth of the mould is 0.08 min.

3.1.4 *Surface texture of internal side and end faces*. The surface texture of each internal side and end face shall not exceed 3.2 μm R_a when determined in accordance with BS 1134.

NOTE The internal faces of moulds usually become smoother with use but the surfaces should be checked annually and at any time that the internal surfaces appear to have been roughened or damaged. (Accurate examples of different surface textures complying with BS 2643-1 permit tactile estimation of the surface texture.)

3.2 *Scoop*, approximately 100 mm wide.

3.3 *Compacting bar or vibrator*. Compacting bar made from iron or steel weighing 1.8 ± 0.1 kg, at least 380 mm long and having a ramming face 25.0 ± 0.5 mm square, or a vibrating hammer or table suitable for compacting the concrete in accordance with **6.2** or **6.3**.

3.4 *Plasterer's steel float*

3.5 *Sampling tray*, minimum dimensions 900 mm × 900 mm × 50 mm deep and of sufficient capacity to accommodate and allow mixing of the concrete required for a set of test beams, of rigid construction and made from a non-absorbent material not readily attacked by cement paste.

3.6 *Square mouthed shovel*, size 2 in accordance with BS 3388.

4 Sampling

Obtain the sample of fresh concrete by the procedure given in BS 1881-101 or BS 1881-125. Commence making the beam as soon as possible after sampling.

5 Preparing the sample

Empty the sample from the container(s) on to the sampling tray. Ensure that no more than a light covering of slurry is left adhering to the container(s).

Thoroughly mix the sample by shovelling it to form a cone on the sampling tray and turning this over with the shovel to form a new cone, the operation being carried out three times. When forming the cones, deposit each shovelful of the material on the apex of the cone so that the portions which slide down the sides are distributed as evenly as possible and so that the centre of the cone is not displaced. Flatten the third cone by repeated vertical insertion of the shovel across the apex of the cone, lifting the shovel clear of the concrete after each insertion.

NOTE The following modifications to the mixing procedures may be necessary when preparing samples of very high workability concrete (e.g. superplasticized concrete) for test.

a) *Sampling tray*. The vertical lips on the edges of the tray may have to be larger to contain the sample without spillage during mixing.

b) *Mixing the sample*. The coning procedure is not suitable for very high workability concrete and the following alternative method of mixing is recommended. Having poured the concrete on to the sampling tray, use the shovel to turn the concrete from the outside toward the centre, working progressively round all sides of the sampling tray.

CAUTION. When cement is mixed with water, alkali is released. Take precautions to avoid dry cement entering the eyes, mouth and nose when mixing concrete. Prevent skin contact with wet cement or concrete by wearing suitable protective clothing. If cement or concrete enters the eye, immediately wash it out thoroughly with clean water and seek medical treatment without delay. Wash wet concrete off the skin immediately.

6 Procedure

6.1 Filling the mould. Place the mould on a rigid horizontal surface or on the vibrating table and fill with concrete in such a way as to remove as much entrapped air as possible (without significantly reducing the amount of entrained air, if present) and to produce full compaction of the concrete with neither excessive segregation nor laitance. For this purpose, by means of the scoop, place the concrete in the mould in layers approximately 50 mm deep and compact each layer by using either the compacting bar or the vibrator in the manner described in **6.2** or **6.3**. After the top layer has been compacted, smooth it level with the top of the mould, using the plasterer's float, and wipe clean the outside of the mould.

6.2 Compacting with compacting bar. When compacting each layer with the compacting bar, distribute the strokes of the compacting bar in a uniform manner over the cross-section of the mould, and ensure that the compacting bar does not penetrate significantly any previous layer nor forcibly strike the bottom of the mould when compacting the first layer. The number of strokes per layer required to produce full compaction will depend upon the workability of the concrete but in no case shall the concrete be subjected to less than 150 strokes per layer for 150 mm specimens or 100 strokes per layer for 100 mm specimens, except in the case of very high workability concrete. Record the number of strokes.

6.3 Compacting with vibrator. When compacting each layer by means of the hammer or vibrating table use applied vibration of the minimum duration necessary to achieve full compaction of the concrete. Over-vibration may cause excessive segregation and laitance or loss of entrained air, if present. The required duration of vibration will depend upon the workability of the concrete and the effectiveness of the vibrator and vibration shall cease as soon as the surface of the concrete becomes relatively smooth and has a glazed appearance. Record the duration of vibration.

7 Report

7.1 General. The report shall affirm that the beams were made in accordance with this Part of this British Standard. The report shall state whether or not a certificate of sampling is available. If available, a copy of the certificate shall be provided.

7.2 Information to be included in the test report

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

a) date, time and place of sampling and sample identity number;

b) time and place of making beams;

c) number and nominal size of beams;

d) method of compaction (hand or vibration) including type of equipment used and number of strokes of the compacting bar or duration of vibration;

e) identification number or codes of beams;

f) name of person making beams;

g) certificate that the beams were made in accordance with this Part of this standard.

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

a) name of project and place where concrete used;

b) name of supplier and source of concrete;

c) date and time of production of concrete or delivery to site;

d) specification of concrete mix (e.g. strength grade);

e) workability of concrete;

f) air content of concrete (if air-entrained);

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

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Publications referred to

BS 308, *Engineering drawing practice.*

BS 308-3, *Geometrical tolerancing.*

BS 891, *Methods for hardness test (Rockwell method) and for verification of hardness testing machines (Rockwell method).*

BS 907, *Specification for dial gauges for linear measurement.*

BS 957, *Specification for feeler gauges.*

BS 1134, *Method for the assessment of surface texture.*

BS 1881, *Methods of testing concrete.*

BS 1881-101, *Method of sampling fresh concrete on site.*

BS 1881-108, *Method for making test cubes from fresh concrete*[1)].

BS 1881-110, *Method for making test cylinders from fresh concrete*[1)].

BS 1881-111, *Method of normal curing of test specimens (20 °C method)*[1)].

BS 1881-112, *Methods of accelerated curing of test cubes*[1)].

BS 1881-113, *Method for making and curing no-fines test cubes*[1)].

BS 1881-125, *Methods for mixing and sampling fresh concrete in the laboratory.*

BS 2634, *Specification for roughness comparison specimens.*

BS 2634-1, *Specification for turned, ground, bored, milled, shaped and planed specimens.*

BS 3388, *Forks, shovels and spades.*

BS 5204, *Specification for straightedges.*

BS 5204-2, *Steel or granite straightedges of rectangular section.*

BS 5328, *Methods for specifying concrete, including ready-mixed concrete.*

ISO 1920, *Concrete tests — Dimensions, tolerances and applicability of test specimens*[1)].

[1)] Referred to in the foreword only.

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