

British Standard

## Testing concrete

Part 109. Method for making test beams from fresh concrete

Essais du béton

Partie 109. Méthode de confection de poutres d'essai en béton frais

Prüfverfahren für Beton

Teil 109. Verfahren zur Herstellung von Probekörpern aus Frischbeton

### 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 : Part 3 : 1970.

Together with Parts 108, 110, 111, 112 and 113, this Part of BS 1881 supersedes BS 1881 : Part 3 : 1970, which is withdrawn.

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

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

### 1. Scope

This Part of this British Standard describes a method for making test beams of nominal sizes 150 mm x 150 mm x 750 mm long and 100 mm x 100 mm x 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 x 100 mm x 500 mm long beams and 40 mm for 150 mm x 150 mm x 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 page.

### 2. Definitions

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

### 3. Apparatus

#### 3.1 Mould

3.1.1 *Construction and assembly.* The sides and ends of the mould shall be of ferrous metal (preferably cast iron or cast steel). The hardness of each internal face shall be at least 95 Rockwell (scale B) Hardness Value\* when determined in accordance with BS 891 : Part 1. The mould shall include a removable steel 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 them and the base plate shall be thinly coated with oil or grease to prevent loss of water. The parts of the mould when assembled shall be positively located and 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 with a reference number or code to enable each concrete specimen to be identified when it is demoulded and the mould to be correctly re-assembled.

A mould should be refurbished or discarded when any dimensional deviation exceeds twice the tolerance specified in 3.1.2.

\* The purchaser should note the need to accept the indentations on the face

3.1.2 *Tolerances* When assembled, the dimensions and internal faces of a new mould shall be accurate within the following limits.

(a) *Dimensions* The depth and internal width of the mould, each based on the average of six measurements symmetrically placed along the axis of the mould, shall be the nominal size of  $150 \pm 0.15$  mm\*, or  $100 \pm 0.15$  mm\*.

b) *Flatness*. The flatness tolerance (see BS 308 : Part 3) for each internal side face shall be 0.03 mm wide per 150 mm length and 0.15 mm wide for the entire surface. That for the joint faces, for the bottom surface of the mould and for the top surface of the base plate shall be 0.06 mm wide per 150 mm length and 0.25 mm for the entire surface.

(c) *Squareness* The squareness tolerance (squareness 4 of BS 308 : Part 3) for each internal side face with respect to the bottom surface of the mould as datum face shall be 0.5 mm wide.

(d) *Parallelism*. The parallelism tolerance (parallelism 4 of BS 308 : Part 3) for the top surface of the mould with respect to the bottom surface of the mould as datum face, and for one internal side face with respect to the other internal side face as datum face, shall be 1.0 mm wide.

(e) *Surface texture*. The surface texture of each internal face shall not exceed  $3.2 \mu m R_a$ , when determined in accordance with BS 1134.

3.2 Scoop, approximately 100 mm wide.

3.3 *Compacting bar or vibrating hammer or table*.

A compacting bar made out of steel bar weighing 1.8 kg, 380 mm long and having a ramming face 25 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*, 1.2 m x 1.2 m x 50 mm deep made from minimum 1.6 mm thick non-corrodible metal.

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 : Part 101. 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 coring 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.

## 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;

\* This tolerance should be considered in conjunction with those for flatness, squareness and Parallelism.

- (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.

7.22 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  
Part 3 Geometrical tolerancing
- BS 891 Method for Rockwell hardness test  
Part 1 Testing of metals
- BS 1134 Method for the assessment of surface texture
- BS 1881 Methods of testing concrete  
Part 101 Method of sampling fresh concrete on site  
Part 108\* Method for making test cubes from fresh concrete  
Part 110\* Method for making test cylinder from fresh concrete  
Part 111\* Method of normal curing of test specimens (20 °C method)  
Part 112\* Methods of accelerated curing of test cubes  
Part 113\* Method for making and curing no-fines test cubes
- BS 3388 Forks, shovels and spades
- BS 5328 Methods for specifying concrete, including readymixed concrete
- ISO 1920' Concrete tests - Dimensions, tolerances and applicability of test specimens

\* Referred to in the foreword only.