BS 1881-119:2011

BSI Standards Publication

Testing concrete –

Part 119: Method for determination of compressive strength using portions of beams broken in flexure (equivalent cube method)

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Publishing and copyright information

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Contents

List of figures

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 4, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 1881 was published by BSI and came into effect on 30 November 2011. It was prepared by Subcommittee B/517/1, *Concrete production and testing*, under the authority of Technical Committee B/517, *Concrete and related products*. A list of organizations represented on these committees can be obtained on request to their secretary.

Supersession

This part of BS 1881 supersedes BS 1881-119:1983, which is withdrawn.

Relationship with other publications

BS 1881 contains test methods for concrete currently used in the UK which are not covered by BS EN 12350 (all parts), BS EN 12390 (all parts) and BS EN 12504. Reference is made to the relevant part of BS EN 12350, BS EN 12390 and BS EN 12504 where appropriate. These test methods should be used in conjunction with BS EN 206-1.

BS 1881 is published in the following parts:

- BS 1881-113, *Method for making and curing no-fines cubes*;
- BS 1881-119, *Method for determination of compressive strength using portions of beams broken in flexure (equivalent cube method)*;
- BS 1881-122, *Method for determination of water absorption*;
- BS 1881-124, *Methods for analysis of hardened concrete*;
- BS 1881-125, *Method for mixing and sampling fresh concrete in the laboratory*;
- BS 1881-128, *Method for analysis of fresh concrete*;
- BS 1881-129, *Method for the determination of density of partially compacted semi-dry fresh concrete*;
- BS 1881-130, *Method for temperature matched curing of concrete specimens*;
- BS 1881-131, *Methods for testing cement in a reference concrete*;
- BS 1881-201, *Guide to the use of non-destructive methods of test for hardened concrete*;
- BS 1881-204, *Recommendations on the use of electromagnetic covermeters*;
- BS 1881-206, *Recommendations for determination of strain in concrete*;
- BS 1881-207, *Recommendations for the assessment of concrete strength by near-to-surface tests*;
- BS 1881-208, *Recommendations for the initial surface absorption of concrete*;
- BS 1881-209, *Recommendations for the measurement of dynamic modulus of elasticity of concrete*;
- DD 216, *Determination of chloride content of fresh concrete*.

Information about this document

This is a full revision of the standard.

In this compressive strength test on portions of broken beams the application of the test load is the same method and to the same precision as for the cube compression test.

A suitable jig with auxiliary platens which give a more positive location of the specimen is illustrated.

No estimate is given for repeatability or reproducibility in this part of this British Standard. Reference should be made to BS ISO 5725-2 for further information on the determination of repeatability and reproducibility.

Hazard warnings

Where skin is in contact with fresh concrete, skin irritations are likely to occur owing to the alkaline nature of cement. The abrasive effects of sand and aggregate in the concrete can aggravate the condition. Potential effects range from dry skin, irritant contact dermatitis, to severe burns in cases of prolonged exposure. Take precautions to avoid dry cement entering the eyes, mouth and nose when mixing mortar or concrete by wearing suitable protective clothing. Take care to prevent fresh concrete from entering boots and use working methods that do not require personnel to kneel in fresh concrete. Unlike heat burns, cement burns might not be felt until some time after contact with fresh concrete, so there might be no warning of damage occurring. 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. Barrier creams may be used to supplement protective clothing but are not an alternative means of protection.

Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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1 Scope

This part of BS 1881 describes an equivalent cube method for determining the compressive strength of hardened concrete using portions of beams broken in flexure.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 8500 (all parts) *Concrete – Complimentary British Standard to BS EN 206-1*.

BS EN 206-1, *Concrete – Part 1: Specification, performance, production and conformity*

BS EN 12390-4, *Testing hardened concrete – Part 4: Compressive strength – Specification for testing machines*

BS EN 12390-5, *Testing hardened concrete – Part 5: Flexural strength of test specimens*

BS EN 12390-7, *Testing hardened concrete – Part 7*: Density of hardened concrete

3 Terms and definitions

For the purposes of this British Standard the definitions given in BS 8500 (all parts) and BS EN 206-1 apply.

4 Apparatus

4.1 *Compression testing machine*, conforming to BS EN 12390-4.

4.2 *Auxiliary platens*, two square steel auxiliary platens equating to the nominal cross-section dimension of the beams, conforming to BS EN 12390-4, which may form part of a jig to hold the specimen (see Figure 1), sized such that the position of the specimen in the test machine described in **6.1** is achieved.

5 Test specimens

5.1 General

Test specimens shall be broken portions of beams that have been tested in accordance with BS EN 12390-5.

Test specimens shall be free from cracks, chipped surfaces and other obvious defects within the length to be tested.

5.2 Dimensions

Test specimens shall have a minimum length of not less than the nominal width of the beam plus 50 mm.

5.3 Mass and density

If specified, the mass and density of the specimen shall be obtained in accordance with BS EN 12390-7.

5.4 Storage of specimens

During the interval between testing the specimens as beams in accordance with BS EN 12390-5 and testing the portions as cubes, the specimens shall be stored in water at a temperature of (20 ±2) °C and shall be tested immediately on removal from the water, while still wet.

6 Procedure

6.1 Placing the specimen in the machine

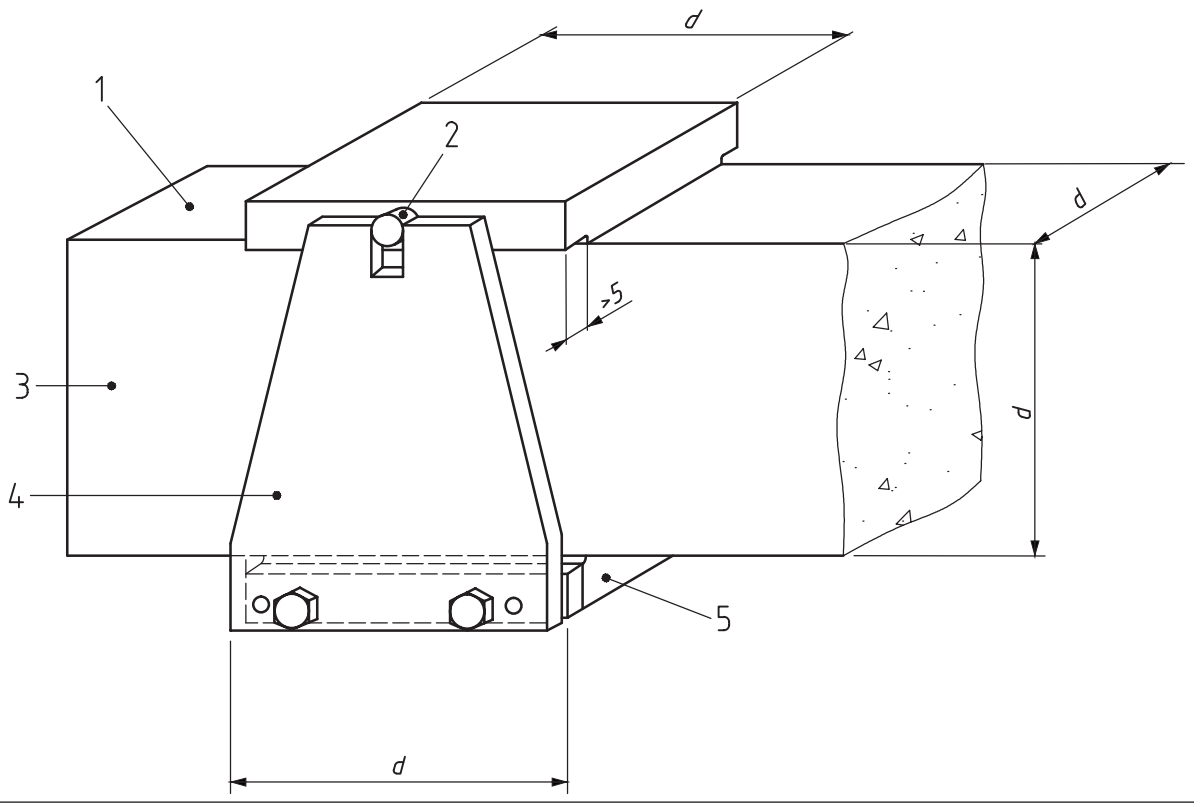
6.1.1 Wipe the specimen, bearing surfaces of the machine and the auxiliary platens to remove any surface water, loose grit or other material.

6.1.2 Place the specimen between the auxiliary platens so the load is applied to the two sides adjacent to the uppermost surface as cast.

6.1.3 Centre the specimen carefully on the lower platen of the machine so that it does not touch the jig supports. Align the upper auxiliary platen directly over the lower platen with at least 25 mm of specimen extending beyond each of the two opposite edges.

6.1.4 To ensure that the specimen and auxiliary platens remain located correctly throughout the test, mark the position of the upper platen on the specimen or use a suitable jig similar to that in Figure 1. Do not use any packing between the surfaces of the specimen and the auxiliary platens or between the auxiliary platens and the platens of the machine.

Figure 1 **A typical jig locating specimens for the compression test on beams broken in flexure**



Key

1 Upper auxiliary platen
2 Dowel
3 Specimen
4 Guide supports belted or welded to bottom plate
5 Lower auxiliary platen

6.2 Loading

6.2.1 Select a constant rate of loading within the range (0.6 ±0.2) N/mm².s. After the application of the initial load, which does not exceed approximately 30% of the failure load, apply the load to the specimen without shock and increase continuously at the selected constant rate ±10%, until no greater load can be sustained.

6.2.2 When using manually controlled testing machines, correct any tendency for the selected rate of loading to decrease as specimen failure is approached, by appropriate adjustment of the control.

6.2.3 Record the maximum load applied to the specimen and the appearance of the concrete and any unusual features in the type of failure.

7 Calculation and expression of results

The equivalent cube compressive strength of each specimen shall be calculated by dividing the maximum load by the area of contact of the auxiliary platens and shall be expressed to the nearest 0.1 N/mm^2.

8 Test report

The test report shall include

a) identification of the specimen;

b) condition of specimen when received (include poor compaction, honeycombing or bad dimensions);

c) date of receipt of the specimen;

d) type and checked nominal or measured dimensions of the specimen;

e) any surface preparation performed when testing the beam in accordance with BS EN 12390-5;

f) conditions of curing or storage at the laboratory;

g) moisture condition at testing (saturated or moist);

h) date of test;

i) age of the specimen at time of testing;

j) mass of the specimen (as-received or saturated), if specified;

k) density of the specimen (as-received or saturated, and the method of determining the volume), if specified;

l) maximum load at failure;

m) equivalent cube compressive strength;

n) appearance of concrete and type of fracture if these are unusual;

o) certificate that the test has been carried out in accordance with this British Standard;

p) copy of test report on original sample tested in accordance with BS EN 12390-5; and

q) other remarks as appropriate.

Bibliography

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN 12350 (all parts), *Testing fresh concrete*

BS EN 12390 (parts 1-3, 6 and 8), *Testing hardened concrete*

BS EN 12504, *Testing concrete in structures*

BS ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results – Part 2: Basic methods for the determination of repeatability and reproducibility of a standard measurement method*

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BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

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