SANS 5863:2006
Edition 2.1

Any reference to SABS SM 863 is deemed to be a reference to this standard (Government Notice No. 1373 of 8 November 2002)

SOUTH AFRICAN NATIONAL STANDARD

Concrete tests — Compressive strength of hardened concrete
Table of changes

<table>
<thead>
<tr>
<th>Change No.</th>
<th>Date</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amdt 1</td>
<td>2006</td>
<td>Amended to change the designation of SABS standards to SANS standards and to update a referenced standard.</td>
</tr>
</tbody>
</table>

Acknowledgement

The SABS Standards Division wishes to acknowledge the valuable assistance derived from publications of the following organizations:

- The American Society for Testing and Materials
- The British Standards Institution
- The International Organization for Standardization

Foreword

This South African standard was approved by National Committee SABS SC 59A, Construction standards – Cement, lime and concrete, in accordance with procedures of the SABS Standards Division, in compliance with annex 3 of the WTO/TBT agreement.

This edition cancels and replaces the first revision (SABS SM 863:1994).

A vertical line in the margin shows where the text has been technically modified by amendment No. 1.

Annex A is for information only.

Reaffirmed and reprinted in May 2012. This standard will be reviewed every five years and be reaffirmed, amended, revised or withdrawn.
Concrete tests — Compressive strength of hardened concrete

1 Scope
This standard specifies a method of determining the compressive strength of test specimens of hardened concrete. The test specimens may consist of cubes or cylinders, or cubes cut from half-prisms that have been used for the determination of flexural strength (see SANS 5864).

2 Normative references
The following standards contain provisions which, through reference in this text, constitute provisions of this standard. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this standard are encouraged to take steps to ensure the use of the most recent editions of the standards indicated below. Information on currently valid national and international standards can be obtained from the SABS Standards Division.

BS 1881-115, Specification for compression testing machines for concrete.


SANS 5860, Concrete tests — Dimensions, tolerances and uses of cast test specimens.

SANS 5861-2, Concrete tests — Sampling of freshly mixed concrete.

SANS 5861-3, Concrete tests — Making and curing of test specimens.

3 Apparatus
Compression testing machine, that is of sufficient capacity and that complies with the requirements of EN 12390-4.

4 Preparation of test specimens
Obtain samples of concrete and prepare and cure a set of three test specimens, as described in the relevant clauses of SANS 5861-2 and SANS 5861-3, respectively.

Do not use test specimens that have been damaged during or after demoulding.
If there is any doubt as to whether specimens comply with the requirements regarding the angles and flatness of the load-bearing surfaces, check these characteristics in accordance with the requirements of SANS 5860.

NOTE Half-prisms, used for the determination of compressive strength, have to be cut with a concrete saw and, if necessary, ground as described in 6.4.1, before being checked for compliance with the requirements of SANS 5860 with regard to dimensions and angles for cubes, and before being tested.

4.1 Dimensions

Remove surface water, grit and projecting fins and determine the following dimensions for each test specimen, in each direction shown in figure 1:

a) of cubes, the basic dimension $d$; and

b) of cylinders, the diameter $d$ and the height $L$.

Calculate the mean dimensions for each specimen, to the nearest millimetre.

4.2 Angles

Check the angles between the load-bearing surfaces and the adjacent surfaces (see figure 2), for compliance with SANS 5860.

4.3 Flatness of surfaces

Check the flatness of the load-bearing surfaces for compliance with SANS 5860 (e.g. $0.5 \text{ mm/m}$ of edge length).

4.4 Adjustment of test specimen dimensions

The dimensions of test specimens that do not comply with the requirements of SANS 5860 may be adjusted as follows:

a) uneven surfaces may be levelled by grinding or by capping;

b) the deviation of angles may be corrected only by cutting and grinding.

4.4.1 Cutting and grinding

Carry out cutting and grinding in such a way that structural changes to the test specimens are avoided.

NOTE Specimens that have been cut and ground have to be kept in water for at least 48 h before testing.

4.4.2 Capping of load-bearing surfaces

Ensure that the materials used for providing an equalizing layer on the load-bearing face of cylinders adhere to the concrete and do not affect it in any way.

At the time of testing, the compressive strength of the equalizing layer should be not less than the expected compressive strength of the concrete.

The thickness of the equalizing layer for the compressive strength test should not exceed $2\%$ of the lateral diameter of the load-bearing surface of the test specimen.

NOTE Suitable capping materials and methods of application are described in SANS 5865. Specimens that have been capped have to be kept in water for at least 48 h before testing.
5 Test procedure

5.1 Test each specimen immediately after it has been removed from the water and while it is still saturated. Remove surface water, grit and projecting fins, and determine the mass (to an accuracy of at least 1%) of each specimen before testing it.

5.2 Wipe clean the bearing surfaces of the platens of the compression testing machine, and so position a specimen in the machine that the load is applied to opposite as-cast faces of the specimen in the case of cubes (i.e. not to the top and bottom), and to the load-bearing faces in the case of cylinders. Do not use any packing. Align the axis of the specimen with the centre of thrust of the spherically seated platen because this platen is brought to bear on the specimen and, if necessary, adjust the platen gently by hand to achieve uniform contact.

5.3 Apply the compression load without shock and increase it continuously at a uniform rate of between 0.3 MPa/s ± 0.1 MPa/s until the specimen fails, i.e. until no greater load can be sustained by the specimen. Record the maximum load applied, the appearance of the specimen and any unusual feature in the type of failure.

5.4 Test the other specimen in the same way.

6 Expression and recording of results

Calculate the compressive strength of each specimen, using the formula

\[ f_{cc} = \frac{F}{A_c} \]

where

- \( f_{cc} \) is the compressive strength, in megapascals;
- \( F \) is the maximum load at failure, in newtons;
- \( A_c \) is the cross-sectional area of the specimen on which the compressive force acts, in square millimetres.

Calculate and record the average compressive strength to the nearest 0.5 MPa.

NOTES

1. A test result is considered valid if the difference between the highest and lowest result does not exceed 15% of the average. If this is not the case, regard the result as unreliable and investigate the reason.

Examples of satisfactory and some unsatisfactory failures of cube are given in figures 3 and 4 respectively.

2. If the apparent saturated density of the test specimen has to be reported, calculate it by dividing the mass of each test specimen, determined in accordance with 6.1, by its volume, calculated from the dimensions determined in accordance with 5.1, and calculate the average for all test specimens.

7 Test report

Refer to this test method in the report and include the following information, where applicable:

a) identification of and the date of casting of the specimens;

b) the number, shape and nominal size of specimens;