



SLOVENSKI STANDARD
SIST EN 12390-3:2002
01-maj-2002

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Testing hardened concrete - Part 3: Compressive strength of test specimens

Prüfung von Festbeton - Teil 3: Druckfestigkeit von Probekörpern

Essais pour béton durci - Partie 3: Résistance a la compression des éprouvettes

Ta slovenski standard je istoveten z: EN 12390-3:2001

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ICS:

91.100.30	Beton in betonski izdelki	Concrete and concrete products
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12390-3

December 2001

ICS 91.100.30

English version

Testing hardened concrete - Part 3: Compressive strength of test specimens

Essais pour béton durci - Partie 3: Résistance à la compression des éprouvettes

Prüfung von Festbeton - Teil 3: Druckfestigkeit von Probekörpern

This European Standard was approved by CEN on 2 September 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard has been prepared by Technical Committee CEN /TC 104, "Concrete", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2002, and conflicting national standards shall be withdrawn at the latest by December 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This standard is based on the draft International Standard ISO 4012 — Concrete — Determination of compressive strength of test specimens.

It is recognised good practice to include measurement of density prior to the determination of compressive strength.

The methods for adjusting the ends of test specimens, given in annex A, have been validated in a recent laboratory inter-comparison, part-funded by the EC under the Measurement and Testing Programme, contract MATI-CT-94-0043.

A draft for this standard was published in 1996 for CEN enquiry as prEN 12394. It was one of a series of individually numbered test methods for fresh or hardened concrete. For convenience it has now been decided to combine these separate draft standards into three new standards with separate parts for each method, as follows:

- Testing fresh concrete (EN 12350)
- Testing hardened concrete (EN 12390)
- Testing concrete in structures (EN 12504)

The series EN 12390 includes the following parts where the brackets give the numbers under which particular test methods were published for CEN enquiry:

EN 12390 Testing hardened concrete

Part 1: Shape, dimensions and other requirements for specimens and moulds (former prEN 12356:1996)

Part 2: Making and curing specimens for strength tests (former prEN 12379:1996)

Part 3: Compressive strength of test specimens (former prEN 12394:1996)

Part 4: Compressive strength — Specification for testing machines (former prEN 12390:1996)

Part 5: Flexural strength of test specimens (former prEN 12359:1996)

Part 6: Tensile splitting strength of test specimens (former prEN 12362:1996)

Part 7: Density of hardened concrete (former prEN 12363:1996)

Part 8: Depth of penetration of water under pressure (former prEN 12364:1996)

EN 12390-3:2001 (E)

The annexes A and B are normative.

1 Scope

This standard specifies a method for the determination of the compressive strength of test specimens of hardened concrete.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*.

EN 12350-1, *Testing fresh concrete — Part 1: Sampling*.

EN 12390-1, *Testing hardened concrete — Part 1: Shape, dimensions and other requirements for specimens and moulds*.

EN 12390-2, *Testing hardened concrete — Part 2: Making and curing specimens for strength tests*.

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

EN 12504-1, *Testing concrete in structures — Part 1: Cored specimens — Taking, examining and testing in compression*.

ISO 3310-1, *Test sieves; technical requirements and testing — Part 1: Test sieves of metal wire cloth*.

ISO 5725-1, *Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions*.

Series BS 1881, *Testing concrete*

3 Principle

Specimens are loaded to failure in a compression testing machine conforming to EN 12390-4. The maximum load sustained by the specimen is recorded and the compressive strength of the concrete is calculated.

4 Apparatus

Compression testing machine, conforming to EN 12390-4.

5 Test specimens**5.1 Requirement**

The test specimen shall be a cube, cylinder or core meeting the requirements of EN 12350-1, EN 12390-1, EN 12390-2, or EN 12504-1. If the dimension of the test specimen does not conform to the tolerances for designated size in EN 12390-1, it can be tested in accordance with the procedure given in annex B.

NOTE Damaged specimens or specimens which are badly honeycombed should not be tested.

5.2 Adjustment of test specimens

Where the dimensions or shapes of test specimens do not conform to the requirements given in EN 12390-1 because they exceed the respective tolerances, they shall be rejected, adjusted or tested in accordance with annex B.

One of the methods given in annex A shall be used to adjust specimens.

6 Procedure

6.1 Specimen preparation and positioning

Wipe the excess moisture from the surface of the specimen before placing in the testing machine.

Wipe all testing machine bearing surfaces clean and remove any loose grit or other extraneous material from the surfaces of the specimen that will be in contact with the platens.

Do not use packing, other than auxiliary platens or spacing blocks (see EN 12390-4) between the specimen and the platens of the testing machine.

Position the cube specimens that the load is applied perpendicularly to the direction of casting.

Centre the specimen with respect to the lower platen to an accuracy of $\pm 1\%$ of the designated size of cubic, or designated diameter of cylindrical specimens.

If auxiliary platens are used, align them with the top and bottom face of the specimen.

With two-column testing machines, cubic specimens should be placed with the trowelled surface facing a column.

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6.2 Loading

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Select a constant rate of loading within the range 0,2 MPa/s ($\text{N/mm}^2 \cdot \text{s}$) to 1,0 MPa/s ($\text{N/mm}^2 \cdot \text{s}$). Apply the load to the specimen without shock and increase continuously, at the selected constant rate $\pm 10\%$, until no greater load can be sustained.

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 controls.

Record the maximum load indicated.

6.3 Assessment of type of failure

Examples of the failure of specimen showing that the tests have proceeded satisfactorily are given in figure 1 for cubes and in figure 3 for cylinders.

Examples for unsatisfactory failure of specimens are shown in figure 2 for cubes and in figure 4 for cylinders.

If failure is unsatisfactory this shall be recorded with reference to the pattern letter according to figure 2 or 4 closest to that observed.

NOTE Unsatisfactory failures can be caused by:

- insufficient attention to testing procedures, especially positioning of the specimen;
- a fault with the testing machine.

For cylindrical specimens, failure of the capping before the concrete is an unsatisfactory failure.

EN 12390-3:2001 (E)**7 Expression of results**

The compressive strength is given by the equation:

$$f_c = \frac{F}{A_c}$$

where

f_c is the compressive strength, in megapascals (newtons per square millimetre);

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, calculated from the designated size of the specimen (see EN 12390-1) or from measurements on the specimen according to annex B in mm².

The compressive strength shall be expressed to the nearest 0,5 MPa (N/mm²).

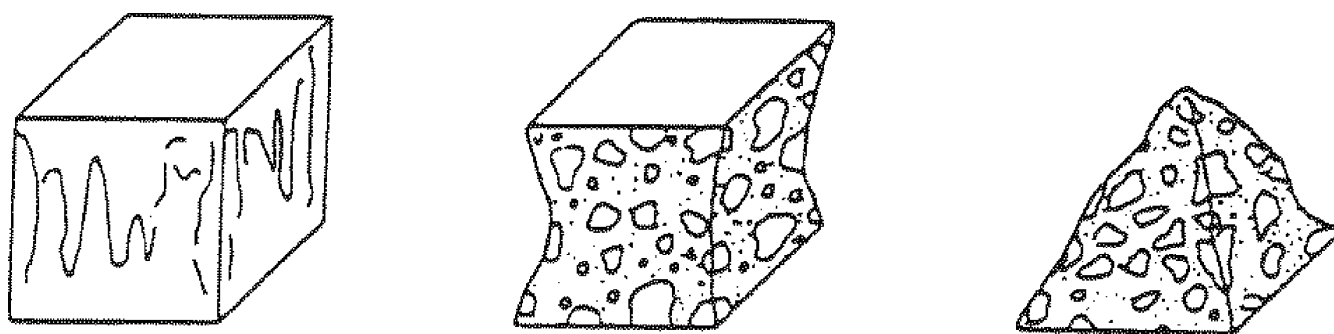
8 Test report

The report shall include:

- a) identification of the test specimen;
- b) designated dimensions of the specimen or if oversize and tested in accordance with Annex B, actual dimensions;
- c) surface condition of the specimen at the time of test;
- d) details of adjustment by grinding/capping (if appropriate);
- e) date of test;
- f) maximum load at failure, in kilonewtons;
- g) compressive strength of specimen in megapascals (to the nearest 0,5 MPa) or newtons per square millimetre (to the nearest 0,5 N/mm²);
- h) unsatisfactory failure (if appropriate) and if unsatisfactory the closest type;
- i) any deviations from the standard method of testing;
- j) a declaration from the person technically responsible for the test that the testing was carried out in accordance with this standard, except as detailed in item i).

The report may include:

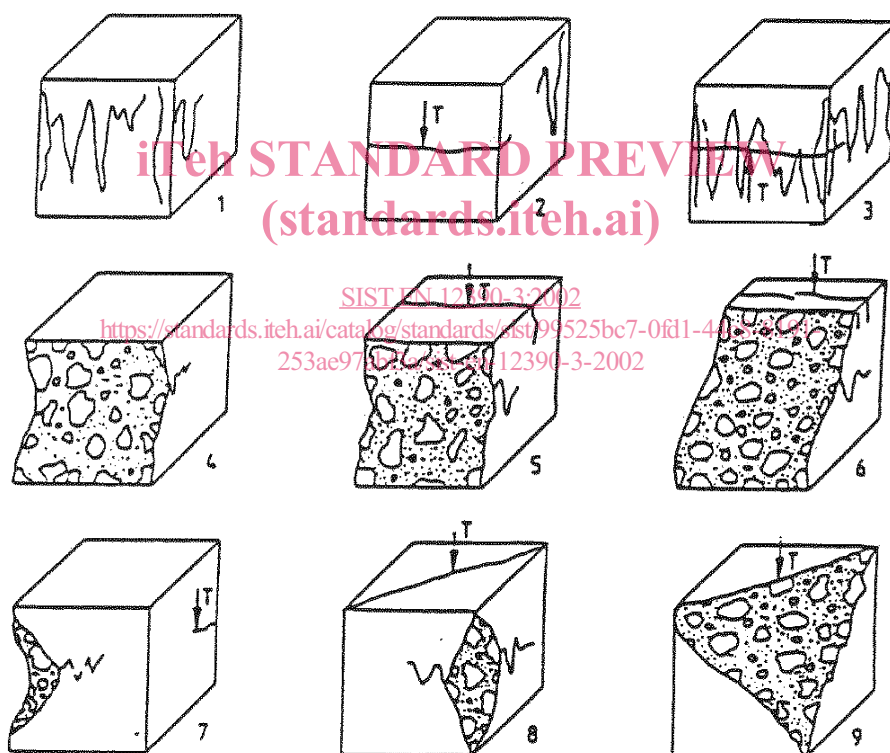
- k) mass of the specimen;
- l) apparent density of specimen, to the nearest 10 kg/m³;
- m) condition of the specimen on receipt;
- n) curing conditions since receipt;
- o) time of test (if appropriate);
- p) age of specimen at time of test.



Explosive failure

NOTE All four exposed faces are cracked approximately equally, generally with little damage to faces in contact with the platens.

Figure 1 — Satisfactory failures of cube specimens



NOTE T = tensile crack

Figure 2 — Some unsatisfactory failures of cube specimens