SLOVENSKI STANDARD
SIST EN 12390-5:2009

01-julij-2009

Nadomeġļa:
SIST EN 12390-5:2001
SIST EN 12390-5:2001/AC:2004

Preskušanje strjenega betona - 5. del: Upogibna trdnost preskušancev

Testing hardened concrete - Part 5: Flexural strength of test specimens

Prüfung von Festbeton - Teil 5: Biegezugfestigkeit von Probekörpern

Essai pour béton durci - Partie 5: Résistance à la flexion sur éprouvettes

Ta slovenski standard je istoveten z: **EN 12390-5:2009**

ICS:

91.100.30	Beton in betonski izdelki	Concrete and concrete products

SIST EN 12390-5:2009 **en,fr**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12390-5

February 2009

ICS 91.100.30

Supersedes EN 12390-5:2000

English Version

Testing hardened concrete - Part 5: Flexural strength of test specimens

Essai pour béton durci - Partie 5: Résistance à la flexion sur éprouvettes

Prüfung von Festbeton - Teil 5: Biegezugfestigkeit von Probekörpern

This European Standard was approved by CEN on 27 December 2008.

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 CEN 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 CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 12390-5:2009: E

Contents

Page

Foreword

This document (EN 12390-5:2009) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, 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 August 2009, and conflicting national standards shall be withdrawn at the latest by August 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12390-5:2000.

It is recognized good practice to include measurement of density prior to the determination of flexural strength, as a check on compaction of the concrete.

The two-point method of loading has been taken as the reference method, but the use of centre-point loading has been included as a normative annex. An inter-comparison of the two-point and the centre-point methods has been made as part of a test programme, part-funded by the EC under the Measurement and Testing Programme, contract MAT I-CT-94-CO43. The centre-point method gave results which were consistently 13 % higher than those from the two-point method.

This standard is one of a series concerned with testing concrete.

The series EN 12390 includes the following parts:

EN 12390 Testing hardened concrete –

Part 1: Shape, dimensions and other requirements for specimens and moulds;

Part 2: Making and curing specimens for strength tests;

Part 3: Compressive strength of test specimens;

Part 4: Compressive strength - Specification for testing machines;

Part 5: Flexural strength of test specimens;

Part 6: Tensile splitting strength of test specimens;

Part 7: Density of hardened concrete;

Part 8: Depth of penetration of water under pressure.

The following amendments have been made to the 2000-10 edition of this standard:

editorial revision

selected loading rate to be applied after the initial (not exceeding approx 20% of the anticipated failure load)

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia,

Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies a method for the determination of the flexural strength of specimens of hardened concrete.

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.

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

EN 12390-1:2000, *Testing hardened concrete – Part 1: Shape, dimensions and other requirements for test 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*

3 Principle

Prismatic specimens are subject to a bending moment by the application of load through upper and lower rollers. The maximum load sustained is recorded and the flexural strength is calculated.

4 Apparatus

4.1 Testing machine

The test shall be carried out using a testing machine conforming to EN 12390-4.

4.2 Force application

The device for applying loads (see Figure 1) shall consist of:

1) two supporting rollers;

2) two upper rollers carried by an articulated cross member, which divides the load applied by the machine equally between the two rollers.

All rollers shall be manufactured from steel and shall have a circular cross-section with a diameter of 20 mm to 40 mm. They shall be at least 10 mm longer than the width of the test specimen.

Three rollers, including the two upper ones, shall be capable of rotating freely around their axis and of being inclined in a plane normal to the longitudinal axis of the test specimen.

The distance, l, between the outer rollers (i.e. the span) shall be equal to 3d, where d is the width of the specimen. The distance between the inner rollers shall be equal to d. The inner rollers shall be equally spaced between the outer rollers as shown in Figure 1. All rollers shall be adjusted to the positions illustrated in Figure 1 to an accuracy of ± 2,0 mm.

5 Test specimens

5.1 General

The test specimens shall be prisms conforming to EN 12390-1. Specimens cast in moulds shall conform to EN 12350-1 and EN 12390-2. The direction of casting shall be identified on the specimen.

Sawn specimens which meet the requirements of EN 12390-1 may also be tested.

The specimens shall be examined and any abnormalities observed shall be reported.

5.2 Adjustment of test specimens

Where the dimensions or shapes of test specimens do not conform to 4.4 of EN 12390-1:2000 because they exceed the respective tolerances, they shall be rejected or adjusted as follows:

1) uneven surfaces shall be levelled by grinding;

2) the deviation of angles shall be corrected by cutting and/or grinding.

6 Procedures

6.1 Preparation and positioning of specimens

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

For specimens stored in water, wipe excess moisture from the surface of the specimen before placing in the testing machine.

Place the test specimen in the machine, correctly centred and with the longitudinal axis of the specimen at right angles to the longitudinal axis of the upper and lower rollers.

Ensure that the reference direction of loading is perpendicular to the direction of casting of the specimen.

NOTE The test result may be affected by the direction of loading with respect to the direction of casting.

6.2 Loading

Do not apply the load until all loading and supporting rollers are resting evenly against the test specimen.

Select a constant rate of stress within the range 0,04 MPa/s (N/mm².s) to 0,06 MPa/s (N/mm².s). After the application of the initial load, which does not exceed approximately 20% of the failure load, apply the load to the specimen without shock and increase continuously, at the selected constant rate ± 1 0 %, until no greater load can be sustained.

The required loading rate is given by the formula:

$$R = \frac{s \times d_1 \times d_2^2}{I} \qquad (1)$$

where:

R is the required loading rate, in N/s;

s is the stress rate, in MPa/s (N/mm².s);

d_1 and d_2 are the lateral dimensions of the specimen, in mm;

I is the spacing of the lower rollers, in mm.

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

Record the maximum load indicated.

Report a fracture if it is outside the loading rollers. (see Figure 1).

7 Expression of results

The flexural strength is given by the equation:

$$f_{cf} = \frac{F \times I}{d_1 \times d_2^2} \quad (2)$$

where

f_{cf} is the flexural strength, in MPa (N/mm²);

F is the maximum load, in N;

I is the distance between the supporting rollers, in mm;

d_1 and d_2 are the lateral dimensions of the specimen, in mm (see Figure 1).

Express the flexural strength to the nearest 0,1 MPa (N/mm²).

8 Test report

The report shall include:

a) identification of the test specimen;

b) designated or measured dimensions of the specimen;

c) details of adjustment by grinding (if appropriate);

d) type of apparatus: two point/centre point;

e) surface moisture condition of specimen at time of test (saturated/moist);

f) date of test;

g) maximum load at failure, in kN;

h) flexural strength of specimen, to nearest 0,1 MPa (N/mm²);

i) location of fracture (if outside upper rollers);

j) appearance of the concrete (if unusual);