SLOVENSKI STANDARD

SIST EN 14651:2005+A1:2008

01-marec-2008

Preskusna metoda za beton s kovinskimi vlakni - Merjenje upogibne natezne trdnosti (meja proporcionalnosti (LOP), zaostale)

Test method for metallic fibre concrete - Measuring the flexural tensile strength (limit of proportionality (LOP), residual)

Prüfverfahren für Beton mit metallischen Fasern - Bestimmung der Biegezugfestigkeit (Proportionalitätsgrenze, residuelle Biegezugfestigkeit)

Méthode d'essai du béton de fibres métalliques - Mesurage de la résistance a la traction par flexion (limite de proportionnalité (LOP), résistance résiduelle)

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91.100.30

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EUROPEAN STANDARD

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English Version

Test method for metallic fibre concrete - Measuring the flexural tensile strength (limit of proportionality (LOP), residual)

Méthode d'essai du béton de fibres métalliques - Mesurage de la résistance à la traction par flexion (limite de proportionnalité (LOP), résistance résiduelle)

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This European Standard was approved by CEN on 3 April 2005 and includes Amendment 1 approved by CEN on 16 August 2007.

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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.

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Foreword

This document (EN 14651:2005+A1:2007) has been prepared by Technical Committee CEN/TC 229 “Precast concrete products”, the secretariat of which is held by AFNOR.

This document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2008 and conflicting national standards shall be withdrawn at the latest by March 2008.

This document includes Amendment 1, approved by CEN on 2007-08-16.

This document supersedes EN 14651:2005.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ⟨A1⟩ ⟨A1⟩.

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

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 United Kingdom.

1 Scope

This European Standard specifies a method of measuring the flexural tensile strength of metallic fibered concrete on moulded test specimen. The method provides for the determination of the limit of proportionality (*LOP*) and of a set of residual flexural tensile strength values.

This testing method is intended for metallic fibres no longer than 60 mm. The method can also be used for a combination of metallic fibres and, a combination of metallic fibres with other fibres.

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, *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*.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
crack mouth opening displacement
linear displacement measured by a transducer installed as specified in 7.1 and illustrated in Figure 4, on a prism subjected to a centre-point load F

3.2
deflection
linear displacement measured by a transducer installed as specified in 7.1 and illustrated in Figure 5, on a prism subjected to a centre-point load F

3.3
limit of proportionality
stress at the tip of the notch which is assumed to act in an uncracked mid-span section, with linear stress distribution, of a prism subjected to the centre-point load F_L defined in 8.2

3.4
residual flexural tensile strength
fictitious stress at the tip of the notch which is assumed to act in an uncracked mid-span section, with linear stress distribution, of a prism subjected to the centre-point load F_j corresponding to $CMOD_j$ where $CMOD_j > CMOD_{F_L}$ or to δ_j where $\delta_j > \delta_{F_L}$ (j = 1,2,3,4)

4 Symbols and abbreviated terms

4.1 Symbols

$CMOD_{F_L}$ — *CMOD* at *LOP*

$CMOD_j$ — value of *CMOD*, j = 1, 2, 3 or 4

F — load

F_j — load value, j = 1, 2, 3 or 4

F_L — load at *LOP*

L — length of test specimen

M — bending moment

M_j — bending moment value, j = 1, 2, 3 or 4

M_L — bending moment corresponding to the load at *LOP*

b — width of test specimen

$f_{R,j}$ — residual flexural tensile strength, j = 1, 2, 3 or 4

$f_{ct,L}^{f}$ — *LOP*

h_{sp} — distance between the tip of the notch and the top of the test specimen in the mid-span section

l — length of span

x — width of notch

y — distance between bottom of test specimen and axis of displacement transducer

δ — deflection

δ_{F_L} — deflection at LOP

δ_j — deflection value, j = 1, 2, 3 or 4

4.2 Abbreviations

CMOD — crack mouth opening displacement

LOP — limit of proportionality

5 Principle

The tensile behaviour of metallic fibre concrete is evaluated in terms of residual flexural tensile strength values determined from the load-crack mouth opening displacement curve or load-deflection curve obtained by applying a centre-point load on a simply supported notched prism.

6 Apparatus

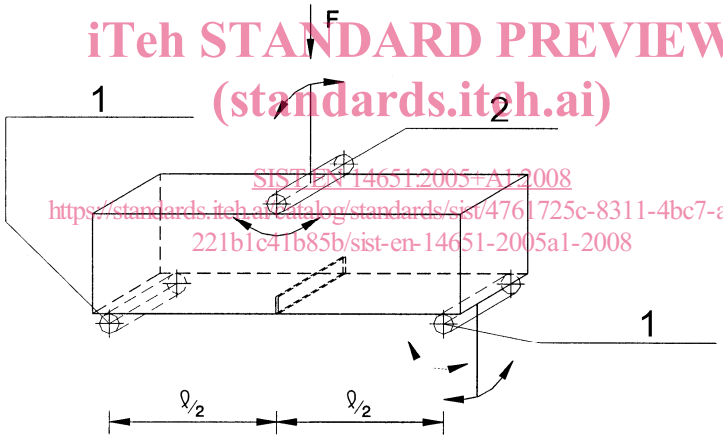
6.1 Saw with rotating carborundum or diamond blade with adjustable and fixable cutting depth and 90° direction of saw-cut to the specimens lengths for notching the test specimens.

6.2 Calliper, capable of reading the dimensions of test specimens to an accuracy of 0,1 mm.

6.3 Rule, capable of reading the dimensions of test specimens to an accuracy of 1 mm.

6.4 Testing machine meeting the machine class 1 requirements in EN 12390-4, capable of operating in a controlled manner i.e. producing a constant rate of displacement (*CMOD* or deflection), and with sufficient stiffness to avoid unstable zones in the load-*CMOD* curve or load-deflection curve.

6.5 Device for transmitting the load of the testing machine to the test specimen, made up of two supporting rollers and one loading roller (see Figure 1).



Key

1 Supporting roller
2 Loading roller

Figure 1 — Arrangement of loading of test specimen

All rollers shall be manufactured from steel and shall have a circular cross-section with a diameter of 30 mm ± 1 mm. They shall be at least 10 mm longer than the width of the test specimen. They shall have a clean and smooth surface.

Two rollers, including the upper one, shall be capable of rotating freely around their axis and of being inclined in a plane perpendicular to the longitudinal axis of the test specimen.

The distance between the centres of the supporting rollers (i.e. the span length) shall be equal to 500 mm. All rollers shall be adjusted to their correct position with all distances having an accuracy of ± 2,0 mm.

6.6 Load measuring device, capable of measuring loads to an accuracy of 0,1 kN.

6.7 Linear displacement transducer(s), capable of measuring displacements to an accuracy of 0,01 mm.

6.8 Device (frame or jig) for mounting displacement transducer(s), capable of being installed in a manner that ensures accurate determination of net mid-span deflections excluding any effects due to seating or twisting of the test specimen on its supports (only if deflection is measured instead of *CMOD*).

6.9 Data recording system coupled directly to electronic outputs of load and *CMOD* or deflection, with a recording rate not less than 5 Hz.

7 Test specimens

7.1 Shape and size of test specimens

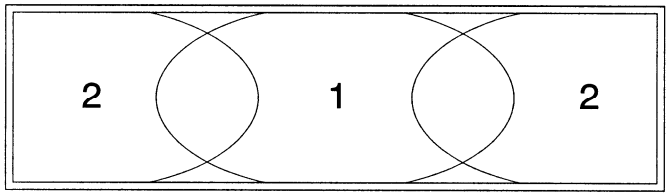
The test specimens shall be prisms conforming to EN 12390-1 with a nominal size (width and depth) of 150 mm and a length L so that 550 mm ≤ L ≤ 700 mm.

The specified shape and size of test specimens are suitable for concrete with maximum size of aggregate no larger than 32 mm and/or metallic fibres no longer than 60 mm.

7.2 Manufacture and curing of test specimens

The test specimens shall be cast and cured in compliance with EN 12350-1 and EN 12390-2 unless specified otherwise.

The procedure for filling the mould is indicated in Figure 2; the size of increment 1 should be twice that of increment 2. The mould shall be filled up to approximately 90 % of the height of the test specimen before compaction. The mould shall be topped up and levelled off while being compacted. Compaction shall be carried out by external vibration. In the case of self-compacting metallic fibre concrete, the mould shall be filled and levelled off without any compaction.



Key

1 and 2 order of filling

Figure 2 — Procedure for filling the mould

7.3 Notching of test specimens

Wet sawing shall be used to notch the test specimens. Specimens shall be rotated over 90° around their longitudinal axis and then sawn through the width of specimen at mid-span (see Figure 3).