SLOVENSKI STANDARD
SIST EN 12390-16:2019

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Preskušanje strjenega betona - 16. del: Določanje krčenja betona

Testing hardened concrete - Part 16: Determination of the shrinkage of concrete

Prüfung von Festbeton - Teil 16: Bestimmung des Schwindens von Beton

Essais pour béton durci - Partie 16 : Détermination du retrait du béton

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 12390-16:2019) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by SN.

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of an identical text or by endorsement, at the latest by April 2020, and conflicting national standards shall be withdrawn at the latest by April 2020.

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

This document is based on ISO 1920-8.

This standard is one of a series on testing concrete.

EN 12390, *Testing hardened concrete*, consists of the following parts:

— *Part 1: Shape, dimensions and other requirements of 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;*

— *Part 10: Determination of the carbonation resistance of concrete at atmospheric levels of carbon dioxide;*

— *Part 11: Determination of the chloride resistance of concrete, unidirectional diffusion;*

— *Part 12: Determination of the potential carbonation resistance of concrete: Accelerated carbonation method (in preparation);*

— *Part 13: Determination of secant modulus of elasticity in compression;*

— *Part 14: Semi-adiabatic method for the determination of heat released by concrete during its hardening process;*

— *Part 15: Adiabatic method for the determination of heat released by concrete during its hardening process;*

— *Part 16: Determination of the shrinkage of concrete;*

— *Part 17: Determination of creep of concrete in compression.*

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This document specifies the procedure for the determination of total shrinkage of concrete specimens in drying conditions.

NOTE 1 Possible shrinkage or length changes occurring before 24 h of age, and which could have significant amplitude and/or consequences, in case of restraint, could need to be measured according to a complementary procedure not covered by this document.

NOTE 2 Information on a simplified procedure for the determination of autogenous shrinkage is given in Annex A.

The test is suitable for specimens having a declared value of D of the coarsest fraction of aggregates actually used in the concrete (D_{max}) not greater than 32 mm.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 and common apparatus*

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

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
total shrinkage
relative change of length in defined conditions of temperature and relative humidity

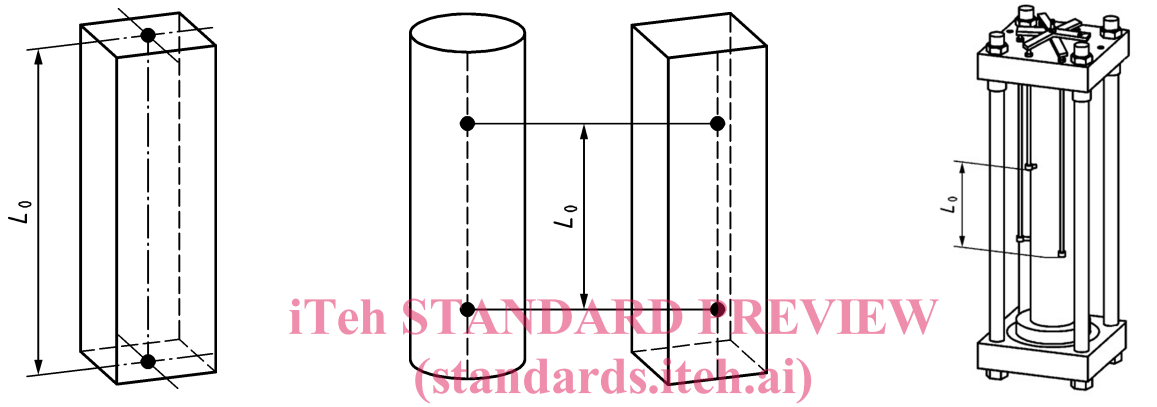
3.2
autogenous shrinkage
relative change of length occurring in isothermal conditions and in the absence of moisture exchange between the specimen and the surrounding environment

3.3
drying shrinkage
difference between total shrinkage and autogenous shrinkage

3.4
gauge length
L_0
base length
length used as reference for strain measurement

Note 1 to entry: Gauge length may be along the principal axis, along a straight line laying on the lateral surface of the specimen and parallel to the principal axis or between two planes (see Figure 1).

3.5
measurement points
positions along the principal axis (see Figure 1 a)), along a straight line laying on the lateral surface of the specimen and parallel to the principal axis (see Figure 1 b)) or in two planes (see Figure 1 c))



a) measurement points along the principal axis

b) measurement points in a line parallel to the principal axis

c) measurement points in two planes

Key

L_0 Gauge length

Figure 1 — Measurement points

4 Principle

Test specimens are subject to changes in length in defined conditions of temperature and relative humidity.

If autogenous shrinkage is to be determined by the simplified procedure, which is needed for the calculation of drying shrinkage, additional specimens are required which are sealed in a protective envelope when moulded or immediately after stripping from the mould (see Annex A).

5 Apparatus

5.1 Drying room or cabinet

A drying room or cabinet with suitably controlled temperature and humidity shall be used for storing specimens in air.

The drying room or cabinet shall meet the following requirements.

a) Air shall be circulated through the room or cabinet so that the same specified conditions are attained adjacent to all specimens under test.

   The air velocity should not exceed 0,5 m/s near the specimens.

b) The temperature in the room or cabinet shall be maintained at (20 ± 2) °C.

c) The relative humidity in the room or cabinet shall have a target value of between 50 % and 70 % and maintained within ± 5 % of the target value. Other values may be used if allowed by national provisions valid in the place of use.

d) The temperature and relative humidity of the room or cabinet shall be monitored throughout the duration of the test and recorded at intervals not exceeding 24 h.

   Separate provisions may be required in the case of manual recording of data during laboratory closure periods.

The drying room or cabinet shall be fitted with suitable racks for storing specimens. The racks shall permit free circulation of air around specimens, except for necessary supports, and shall be so situated with respect to the nearest wall or other obstruction that air circulation is not restricted in the intervening space. The horizontal supports shall consist of non-absorptive members having a total bearing width supporting the specimen of not more than 25 mm.

5.2 Length change measuring system

5.2.1 General

The length change measuring device shall have a resolution of at least 0,001 mm. The maximum permissible error for gauge lengths of 400 mm or more shall be ± 0,01 mm and for gauge lengths less than 400 mm it shall be ± 0,005 mm. Gauges relying on friction contact shall not be used.

5.2.2 Callipers or rule

The callipers or rule shall be capable of determining the gauge length with a maximum permissible error of ± 2,0 mm for gauge lengths of 400 mm or more and ± 1,0 mm for gauge lengths less than 400 mm.

5.2.3 Reference bar (optional)

If a specific reference bar is required, it shall be made of invar metal or other material that has a similar coefficient of expansion over the range of test temperatures.

The reference bar shall be compatible with the measuring apparatus used.

The central section of the reference bar may be covered by a thermal isolating material to minimize the effect of temperature change during handling.