SLOVENSKI STANDARD
SIST EN 1352:2001

01-april-2001

Določevanje statičnih modulov elastičnosti pri tlačnem preskusu avtoklaviranega celičnega betona ali betona iz lahkega agregata z odprto strukturo

Determination of static modulus of elasticity under compression of autoclaved aerated concrete or lightweight aggregate concrete with open structure

Bestimmung des statischen Elastizitätsmodules unter Druckbeanspruchung von dampfgehärtetem Porenbeton und von haufwerksporigem Leichtbeton

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Détermination du module d'élasticité statique en compression du béton cellulaire autoclavé et du béton de granulats légers a structure ouverte

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Ta slovenski standard je istoveten z: **EN 1352:1996**

ICS:

91.100.30	Beton in betonski izdelki	Concrete and concrete products

SIST EN 1352:2001 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1352

December 1996

ICS 91.100.30

Descriptors: concrete, cellular concrete, aggregates, mechanical tests, compression tests, determination, modulus of elasticity

English version

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

The European Standards exist 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 Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 177 "Prefabricated reinforced components of autoclaved aerated concrete or light-weight aggregate concrete with open structure", 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 1997, and conflicting national standards shall be withdrawn at the latest by June 1997.

In order to meet the performance requirements as laid down in the product standards for prefabricated components of autoclaved aerated concrete and of lightweight aggregate concrete with open structure, a number of standardized test methods are necessary.

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

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1 Scope

This European Standard specifies a method of determining the static modulus of elasticity in compression of autoclaved aerated concrete (AAC)[1] or lightweight aggregate concrete with open structure (LAC) according to prEN 1520.

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.

EN 678	Determination of dry density of autoclaved aerated concrete
EN 679	Determination of compressive strength of autoclaved aerated concrete
EN 992	Determination of dry density of lightweight aggregate concrete with open structure
EN 1354	Determination of compressive strength of lightweight aggregate concrete with open structure
prEN 1520	Prefabricated components of lightweight aggregate concrete with open structure
ISO 4012:1978	Testing concrete - Determination of compressive strength of test specimens

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3 Principle

The modulus of elasticity (E-modulus) is determined on prismatic test specimens taken from prefabricated components. It is calculated from the difference of longitudinal compressive strains corresponding to the increase of longitudinal compressive stress from the basic test stress σ_a (approximately 5 % of the declared compressive strength of the concrete) to the upper test stress σ_b (in general one-third of the declared compressive strength of the concrete).

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1) A European Standard for "Prefabricated reinforced components of autoclaved aerated concrete" is in preparation at CEN.

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4 Apparatus

a) any saw suitable for cutting reinforced AAC or LAC components;

b) calipers, capable of reading the dimensions of the test specimens to an accuracy of 0,1 mm;

c) a straight-edge (at least as long as the longest diagonal of the test specimen surfaces, in the case of cylinders: at least as long as the generatrix), feeler gauges (0,2 mm, 0,5 mm (only for LAC), and 1,0 mm for both) and a square;

d) a balance, capable of determining the mass of the test specimens to an accuracy of 0,1 %;

e) a compression testing machine which meets the requirements of ISO 4012:1978. It shall be capable of applying the required load at the specified rate and maintaining it at the required level for at least 60 s;

f) equalizing layers of soft fibreboard with a thickness of (12 ± 2) mm and a density of (250 to 400) kg/m^3 to be inserted between the loadbearing surfaces of the test specimens and the platens of the compression testing machine (not required in the case of levelling the loadbearing surfaces by grinding or capping);

g) a ventilated drying oven capable of maintaining a temperature of (105 ± 5) °C (see note);

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h) gauges for determining the longitudinal deformations or strains with a gauge length according to 6.1, suitable to determine the strains to an accuracy of 5×10^{-6} (e.g. inductive displacement transducers, dial gauges, mirror extensometers, strain gauges etc.).

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NOTE: In addition a ventilated drying oven capable of maintaining a temperature of (40 to 60) °C can be helpful for conditioning of test specimens.

5 Test specimens

5.1 Sample

The sample (normally at least one prefabricated component) for the preparation of the test specimens shall be taken in such a manner that it is representative of the product to be investigated.

Test specimens may be prepared from samples which have previously been used for other tests, provided that they are cut at least 150 mm from an area where visible damage or changes of normal structure and appearance have occurred.

5.2 Shape and size of test specimens

The reference test specimens shall be prisms with square cross-section with the dimensions normally 100 mm x 100 mm x 300 mm.

Prisms of other sizes or other shape of the cross-section or cylindrical test specimens (drilled cores) may be used, provided

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that the smallest cross-sectional dimension is at least 75 mm (but not less than four times the maximum size of the aggregate in the concrete) and the ratio between length L and the smallest cross-sectional dimension D is in the range of $2 \leq L/D \leq 4$. If these requirements are not fulfilled, e.g. in the case of test specimens taken from hollow core components, this shall be stated in the test report.

5.3 Number of test specimens

A test set shall consist of at least three test specimens.

In the case of AAC, whenever possible, one test specimen shall be prepared from the upper third of the component, one from the middle and one from the lower third, in the direction of rise of the mass during manufacture (see figure 1). The position of the test specimens in the material relative to the rise of the mass shall be shown by the numbering, and the direction of rise shall be marked on the test specimens.

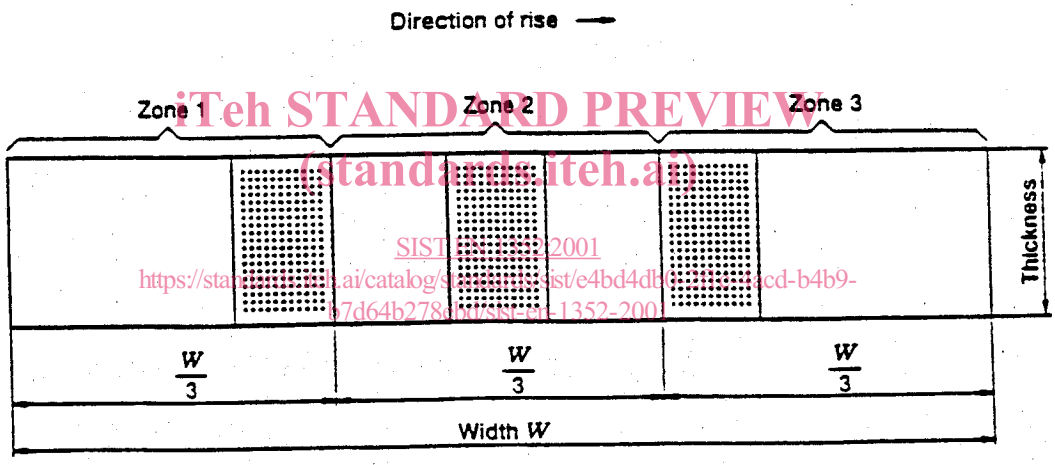

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Figure 1: Sampling scheme for AAC-test specimens

5.4 Preparation of test specimens

The specimens shall be cut not less than 2 d after autoclaving or casting, respectively. The dust or the slurry of the process shall be removed.

They shall be taken in such a way that their longi-tudinal axis is

- in the case of AAC: perpendicular to the rise of the mass during the manufacture;

- in the case of LAC: in the plane of the compression force acting in the component when used in the structure.

The test specimens shall contain no reinforcing bars within the gauge length. (If unavoidable, bars which are perpendicular to the test load can be accepted in exceptional cases. This shall be mentioned in the test report.)

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The loadbearing surfaces of the test specimens (i.e. the faces in contact with the platens of the compression testing machine) shall be plane, parallel to each other and perpendicular to the longitudinal surfaces of the test specimens (in case of cylindrical test specimens to the generatrices).

Planeness of loadbearing surfaces shall be checked across the two diagonals (in the case of cylinders across two orthogonal diameters) using a straight-edge and, if necessary, a feeler gauge. Deviations exceeding 0,2 mm shall be adjusted by cutting and/or grinding, or by capping. In the case of LAC, deviations up to 0,5 mm may be tolerated, provided that equalizing layers of soft fibreboard according to 4 f) are used. Deviations from planeness or regular shape, respectively, of the other surfaces shall not exceed 1,0 mm.

The angle between the loadbearing surfaces and the adjacent longitudinal surfaces (in the case of cylinders: the generatrices) of the test specimens shall not deviate from a right angle by more than 1 mm per 100 mm. This shall be checked along both orthogonal middle axes (in the case of cylinders along two orthogonal diameters) of the loadbearing surfaces by means of a square and a 1 mm-feeler gauge or similar instrument. Larger deviations shall be corrected by cutting or grinding.

5.5 Measurement of test specimens

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The dimensions of the test specimens shall be measured to an accuracy of 0,1 mm, using calipers.

Length and width (in the case of cylindrical test specimens the diameter) of the cross-sectional area, A_c, shall be measured at mid height at two opposite longitudinal sides. The cross-sectional area shall be calculated using the mean values of the results of the measurements.

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The height of the test specimens shall be measured in the middle of two opposite longitudinal sides (in the case of cylinders along two opposite generatrices).

The volume V of the test specimens shall be calculated by multiplying A_c by the mean value of the results of the height measurements.

5.6 Conditioning of test specimens

In the case of AAC the test specimens shall be dried till their mass related moisture content is (6 ± 2) % (see note). In doing so the temperature shall not exceed 60°C.

In the case of LAC the mass related moisture content shall be at least 4 %.

After reaching the specified moisture content, the test specimens shall be stored, protected against moisture changes, for at least 24 h prior to the test at (20 ± 5)°C for ensuring uniform moisture distribution within the test specimen and thermal equilibrium with the temperature in the laboratory.

Immediately before testing and before applying of any devices for measurement of deformations the moist mass, m_{hum}, of the test

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specimens shall be determined to an accuracy of 0,1 % in order to enable calculation of the density and the actual moisture content of the specimen when tested.

Prior to the test, attainment of the specified moisture content may be estimated by comparing the moist density of the test specimens with the dry density determined in accordance with EN 678 (for AAC) and EN 992 (for LAC) on companion specimens extracted from the same area of the same component.

NOTE: The expected moisture content of a test specimen can be calculated from equation (1):

$$\mu_{m,exp} = \frac{\rho_{hum,t} - \rho_{comp}}{\rho_{comp}} \times 100 \qquad \ldots(1)$$

where:

$\mu_{m,exp}$ is the expected mass related moisture content, in per cent;

$\rho_{hum,t} = m_{hum}/V$ is the moist density of the test specimen, calculated by dividing its moist mass m_{hum} by its volume V determined according to 5.5, in kilograms per cubic metre;

ρ_{comp} is the dry density of the companion specimen determined according to EN 678 (for AAC) or EN 992 (for LAC), in kilograms per cubic metre.

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6 Determination of static modulus of elasticity

6.1 Position of gauge points and gauge length

The gauges for determining the longitudinal deformations or compressive strains shall be attached to at least two (better four) opposite longitudinal surfaces of the test specimen. If measurements are performed at two surfaces only, these surfaces should be parallel to the direction of rise in the case of AAC and parallel to the direction of casting in the case of LAC. The middle of the gauge length shall coincide with the middle of the specimen length. The distance of the gauge points to the adjacent end face of the test specimen shall be at least equal to largest cross-sectional dimension (for prisms) or to the half of the diameter of the test specimen (for cylinders). The gauge length should normally be at least 100 mm, but not less than the smallest cross-sectional dimension or two thirds of the diameter, respectively, of the test specimen, and, in the case of LAC, not less than five times the nominal maximum particle size of the aggregate.

6.2 Testing procedure

The platens of the compression testing machine shall be wiped clean, and the test specimen shall be positioned in the compression testing machine. In the case of LAC test specimens where the loadbearing surfaces have not been capped or levelled by grinding and depart