SLOVENSKI STANDARD
SIST EN 12269-1:2001

01-april-2001

Določevanje sprijemnosti med armaturnim jeklom in avtoklaviranim celičastim betonom z upogibnim preskusom nosilca - 1. del: Kratkotrajni preskus

Determination of the bond behaviour between reinforcing steel and autoclaved aerated concrete by the "beam test" - Part 1: Short term test

Bestimmung des Verbundverhaltens zwischen Bewehrungsstahl und dampfgehärtetem Porenbeton mit Hilfe der "Balkenprüfung" - Teil 1: Kurzzeitprüfverfahren

Détermination du comportement d'adhérence entre les barres d'armatures et le béton cellulaire autoclavé par la "méthode d'essai de poutre" - Partie 1: Essai de courte durée

Ta slovenski standard je istoveten z: **EN 12269-1:2000**

ICS:

91.100.30	Beton in betonski izdelki	Concrete and concrete products

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EUROPEAN STANDARD
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English version

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This European Standard was approved by CEN on 10 March 2000.

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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 Central Secretariat 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.

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 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of an identical text or by endorsement, at the latest by October 2000, and conflicting national standards shall be withdrawn at the latest by October 2000.

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.

The European Standard EN 12269 consists of the following parts:

- Part 1: Short-term test method
- Part 2: Long-term test method

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

1 Scope

This European Standard specifies a method of determining the bond behaviour between reinforcing bars and autoclaved aerated concrete (AAC) in prefabricated reinforced components according to prEN 12602:1996. The test method is conceived to obtain values for the short term bond strength, τ_{bm}, with different combinations of concrete type, bar shape and corrosion protection system.

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 678	Determination of the dry density of autoclaved aerated concrete
EN 679	Determination of the compressive strength of autoclaved aerated concrete
prEN 12602:1996	Prefabricated reinforced components of autoclaved aerated concrete

3 Principle

The bond behaviour is investigated by means of a flexural test on a prismatic test specimen (beam) cut from a prefabricated reinforced AAC-component in such a way that it contains one single reinforcing bar situated on the longitudinal median plane near the bottom surface. The dimensions of the test beam are selected such that failure through bar slip is likely to occur.

The AAC is removed in the lower part of the cross-section (tension zone) at midspan, in order to form a type of "hinge", leaving the two adjacent portions of the beam being connected only by the remaining AAC in the compression zone and the steel bar in the tensile zone.

At both ends of the beam, the AAC is removed around the bar over a length of 100 mm in order to avoid a confinement effect above the supports and to reduce the bond length.

The beam is simply supported at its ends in horizontal position and loaded at a steady deflection rate by means of two equal vertical loads acting equidistant from midspan in the central part of the span length.

The tensile force in the steel is calculated, according to Hooke's law, from the longitudinal steel strain measured at midspan, the E-modulus of the steel, and the cross-sectional area of the bar.

The bond stress is calculated by dividing the tensile force in the steel bar by the perimeter of the bar (without anti-corrosion coating) and the total bond length at the half of the beam considered.

Furthermore, the slip of the bar relative to the AAC is measured at both free ends and recorded as a function of the measured steel strain at midspan.

4 Apparatus

a) a saw for cutting test specimens from reinforced components;

b) a core drill with a diameter of the cutting edge of (200 to 300) mm, depending on the specimen height, for removing the AAC in the tensile zone of the cross-section in the midspan area of the beam;

c) a straight-edge and 0,1 mm-feeler gauges for checking the planeness of surface areas where loads and support reactions are transmitted;

d) a room or cabinet, capable of maintaining a temperature of (20 ± 2) °C and a relative humidity of (55 ± 5) %, for conditioning of test beams prior to the test (see note);

e) a loading system with a capacity of approximately 30 kN, allowing the performance of a four point flexural test (see figure 1) on a test beam with a span of (600 to 1200) mm in deflection controlled mode. Deflections shall be determined at midspan by means of a transducer and shall be used for control of rate of movement of the platen of the testing machine or of the loading device.
The test beam shall rest on two supporting rollers through steel distribution plates having a width of (50 ± 2) mm and a thickness of ≥ 10 mm, extending over the full width of the test beam. At least one of the rollers shall be capable of being inclined in a plane perpendicular to the longitudinal axis of the test beam.

The supporting rollers shall be placed at a distance of 50 mm from the end surfaces of the test beam.

The load shall be applied equally to both beam parts, using a bridge profile resting on two rollers positioned perpendicularly to the longitudinal axis of the test beam with a distance of 200 mm. Between the rollers and the upper surface of the test beam steel distribution plates with a width of (30 ± 2) mm and a thickness of ≥ 10 mm, extending over the full width of the test beam, shall be inserted.

Both the supporting rollers and the load-applying rollers shall be manufactured from steel and shall have a circular cross-section with a diameter between (15 to 40) mm. Their length shall be at least equal to the width of the test beam. The axes of all rollers shall be parallel to each other. Each roller, except one of the supporting ones, shall be capable of rotating around its longitudinal axis and of being inclined in a plane normal to the longitudinal axis of the test specimen. After correct centring in the testing machine, the axes of inclination of the three inclinable rollers shall be situated on a vertical plane which shall not deviate by more than ± 1 mm from the axis of the compression force of the testing machine.

The middle axis between the loading rollers or the supporting rollers, respectively, shall not deviate from the vertical axis of the testing machine (axis of the vertical compression force) by more than ± 1 mm.

f) a measuring system, capable of simultaneous measuring and registration of the following data:

- longitudinal strain in the bar (accuracy 2 %);
- slip of the bar at both ends relative to the end surface of the beam (accuracy 0,01 mm).

NOTE: For certain types of corrosion protective coatings it might be necessary to determine the bond behaviour at another temperature than + 20 °C.

5 Test specimens

5.1 Sample

The sample for the preparation of the test specimens shall be taken in such a manner that it is representative of the product to be investigated.

5.2 Shape and size of test specimens

The test specimens shall be beams according to figure 1 which are cut from a reinforced component in a way that the longitudinal bar, of which bond is to be tested, is disposed in the vertical centre plane of the beam with a cover of (15 to 30) mm with respect to the bottom face. If there are further longitudinal bars in the lower part (tension zone when tested) of the beam, they shall be cut at mid-span. The beam shall contain no transverse reinforcement within the AAC.

For usual components the following dimensions shall be used:

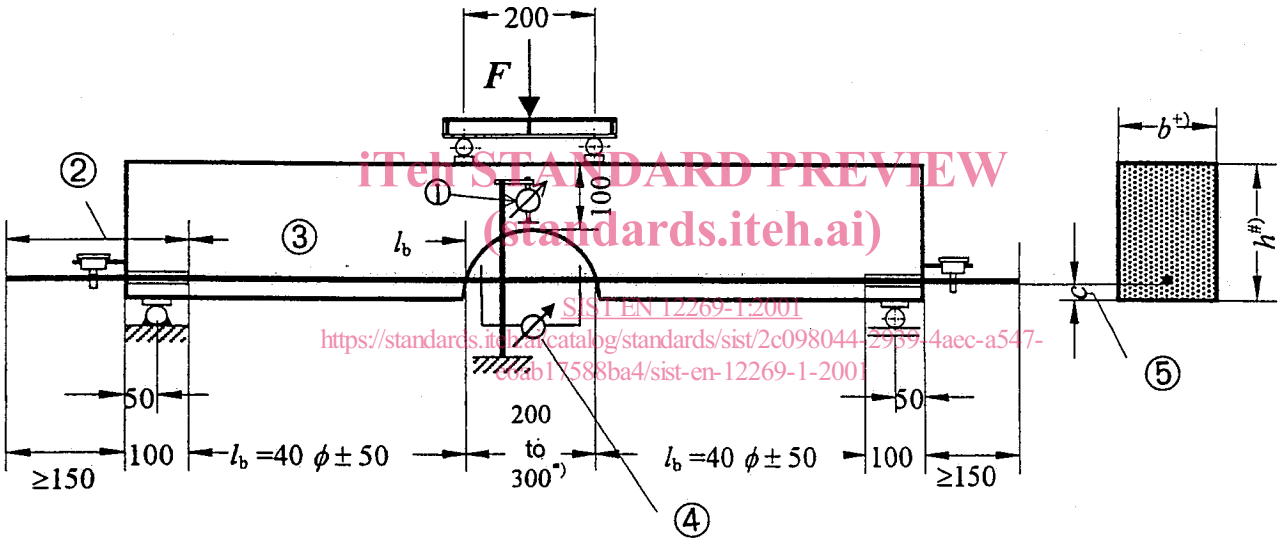
- total height: $h = 200$ mm;
- width: $b = 20\ \phi$, where ϕ is the diameter of the steel bar (not including protective coating), in millimetres;
- concrete cover: 15 mm $\leq c \leq$ 30 mm.

The total length of the beam shall be chosen such that $l_b = 40\phi \pm 50$ mm on each side, where l_b is the bond length over which the bar is in contact with the AAC.

If, in exceptional cases, the cover of the longitudinal bar exceeds 30 mm, test specimens with a total height of $h = 250$ mm shall be used.

At both ends of the beam, the reinforcing bar to be tested shall protrude for at least 150 mm over the vertical end face of the AAC.

Dimensions in millimetres



Key

1) Transducer for vertical displacement
2) Free bar end
3) Bond length
4) Strain measuring base
5) Concrete cover

+) $b = 20\ \phi$, where ϕ is the diameter of the steel bar

#) $h = 200$ mm for concrete cover c = (15 to 30) mm and
$h = 300$ mm for concrete cover $c > 30$ mm

*) 200 to 250 mm for concrete cover c = (15 to 30) mm,
300 mm for concrete cover $c > 30$ mm

200 to 250 mm for concrete cover*)

Figure 1 – Test specimens and loading arrangement

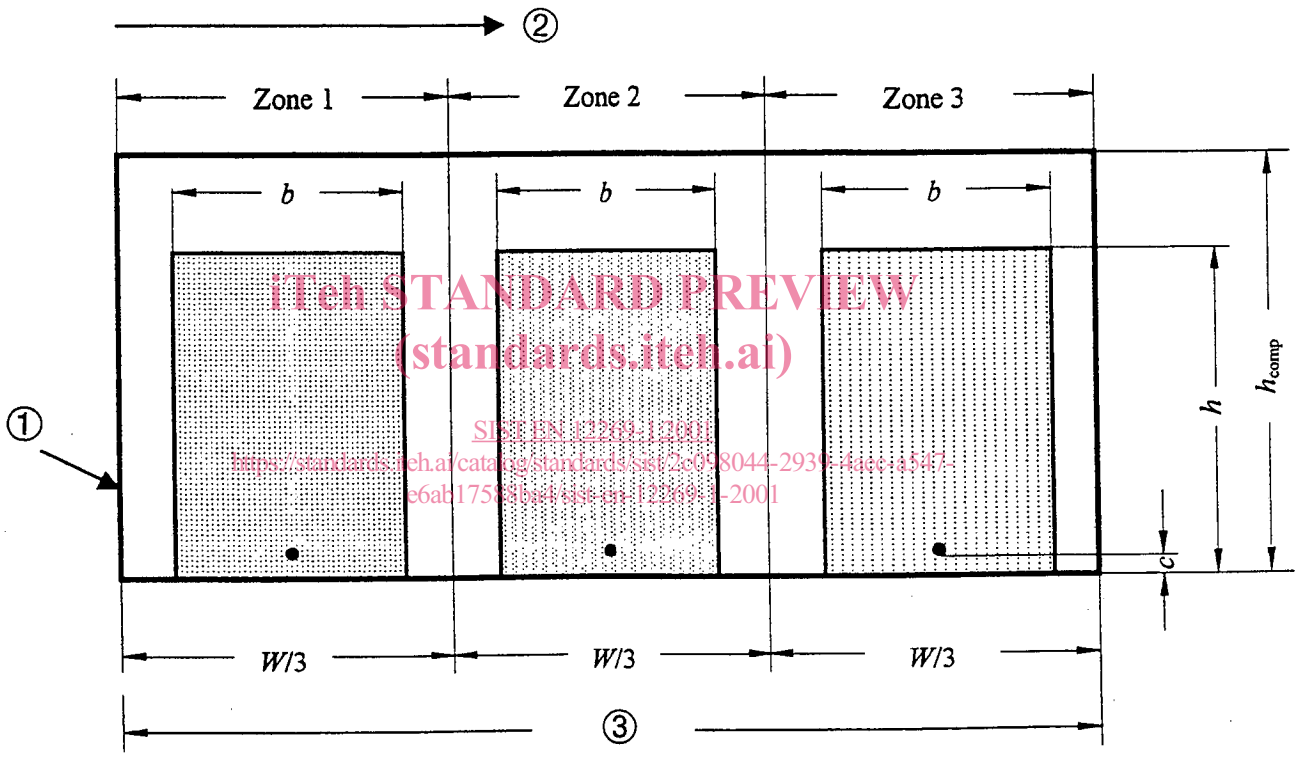
5.3 Number of test specimens

A test set shall consist of three test specimens.

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 2).

5.4 Preparation of test specimens

The test specimens shall be cut from the reinforced component, taking special care to avoid any early damage of bond. All surfaces shall be levelled sufficiently to ensure correct dimensions. The planeness of the surfaces shall be checked along the lines where the loading forces and the support reactions will be applied, by means of a straight edge and, if necessary, by means of feeler gauges. Deviations by more than 0,1 mm shall be corrected by grinding.



Key

1) Cross section of component
2) Direction of rise
3) Width W

Figure 2 – Sampling scheme

At both ends of the beam, the AAC shall be removed from around the bar to be tested over a length of 100 mm in order to eliminate the influence of support pressure on bond.

At midspan the beam shall be provided with a semi-cylindrical hole, diameter (200 to 250) mm for beams with a total height of h = 200 mm (used for concrete cover c = (15 to 30) mm) and 300 mm for beams with a total height of h = 200 mm (used for concrete cover c > 30 mm). This hole is drilled horizontally (or cut out otherwise), perpendicularly to the longitudinal axis, leaving the bar free over a sufficient length in order to fix a strain measuring device. The corrosion-protective coating shall be carefully removed by mechanical means from that part of the bar, where the strain measuring device is to be attached.