SIST

SLOVENSKI STANDARD
SIST EN 1739:2001

01-april-2001

Doloļ evanje striģne trdnosti stikov med montaģnimi elementi iz avtoklaviranega celiļ astega betona ali betona iz lahkega agregata z odprto strukturo pod vplivom sil, ki delujejo v ravnini elementov

Determination of shear strength for in-plane forces of joints between prefabricated components made of autoclaved aerated concrete or lightweight aggregate concrete with open structure

Bestimmung der Schubtragfähigkeit von Fugen zwischen vorgefertigten Bauteilen aus dampfgehärtetem Porenbeton oder haufwerksporigem Leichtbeton bei Belastung in Bauteilebene

Détermination de la résistance au cisaillement des jonctions entre des éléments préfabriqués réalisés en béton cellulaire autoclavé ou en béton de granulats légers a structure ouverte, sous l'effet de forces agissant dans le plan des éléments

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ICS

Descriptors: concrete, cellular concrete, aggregates, reinforcing materials, prefabricated elements, joints, mechanical tests, shear tests, determination, shear strength, test specimen

English version

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This European Standard was approved by CEN on 25 March 1998.

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 Central Secretariat 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 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

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.

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.

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 1998, and conflicting national standards shall be withdrawn at the latest by October 1998.

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.

1 Scope

This European Standard specifies a method of determining the shear strength for in-plane forces of joints between prefabricated components made of autoclaved aerated concrete (AAC) according to prEN 12602 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 the compressive strength of autoclaved aerated concrete
EN 992	Determination of dry density of lightweight aggregate concrete with open structure
EN 1353	Determination of moisture content of autoclaved aerated concrete
EN 1354	Determination of compressive strength of lightweight aggregate concrete with open structure
EN 1356:1996	Performance test for prefabricated reinforced components of autoclaved aerated concrete or lightweight aggregate concrete with open structure under transverse load.
prEN 1520	Prefabricated components of lightweight aggregate concrete with open structure
prEN 12602	Prefabricated reinforced components of autoclaved aerated concrete

3 Principle

The shear strength for in-plane forces of longitudinal joints between two adjacent prefabricated AAC- or LAC-components or sections thereof is determined by applying an in-plane shear force parallel with or with an angle α to the joint.

The load is increased continuously or in steps until failure of the joint. The load-displacement diagram and the failure load are determined. The shear strength is determined from the failure load.

The test can be carried out without lateral restraints (case A) or with lateral restraints preventing in-plane displacements normal to the joint (case B).

4 Apparatus

a) a saw for cutting components and test specimens;

b) a hydraulic jack, capable of applying an in-plane compressive load without shock continuously or in steps. The precision of the jack and the load indication shall be such that the failure load can be determined with an accuracy of ± 3 %. The measuring range shall be such that the failure load is higher than one-tenth of the range used;

c) calipers and/or rule, capable of reading the dimensions of the test specimens and the joints to an accuracy of 1 mm;

d) a loading frame and devices according to figures 1 and 2 for transmitting the load to the test specimen;

e) dial gauges or displacement transducers with a reading accuracy of 0,01 mm for measuring the displacements along and across the joint;

f) plates, supports and supporting rollers made of steel according to figures 1 and 2;

g) (if required) supports (steel plates and steel rollers) to create lateral restraint preventing horizontal displacements normal to the applied load.

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. In the case of AAC, the direction of rise of the mass during manufacture shall be marked on the components.

5.2 Shape and size of test specimens

The test specimen consists of two connected prefabricated components with standard width and thickness or sections thereof. The length of the components or sections shall be two to ten times their width. This is dependent upon the chosen angle between the applied force and the joint and upon the jointing method. When the axis of the test load forms an angle with the joint, the component length shall be such that the test load can be applied within the middle third of the end surfaces of the components or sections (see figure 2).

5.3 Number of test specimens

A test set shall consist of at least three test specimens, each made of two components or sections thereof.

5.4 Preparation of test specimens

AAC components shall be allowed to cool for at least 2 d after autoclaving before being assembled.

LAC components shall be at least 21 d old before being assembled and at least 28 d at testing.

If cutting of components to length or shape is necessary, this shall be done before assembly takes place.

Before jointing, length, thickness, and width of the components shall be measured. The shape and dimensions of the longitudinal faces adjacent to the joint (e.g. tongue and groove) shall also be determined. For a mechanical jointing system dimensions and material properties of all parts shall be indicated.

If the components or sections are frozen or cold, they shall be stored with sufficient space between each other at room temperature for at least 2 d before jointing.

Two components or two sections thereof shall be assembled as shown in figure 1 or 2, each resting on two supports, both consisting of a steel roller with a diameter of at least 40 mm and a steel plate between the roller and the bottom surface of the component.
If the shear force is to be applied parallel to the joint according to figure 1, the force transmitting steel plates shall be fixed to the ends of the components.

If the joint system is mechanical, e.g. nails and plates or similar, the two components shall be joined together dry, without grouting. There shall be at least two mechanical fixings or grouted dowels along such a joint. Defined tolerances for the mechanical fixings may be taken into account.

If the components are joined with mortar or concrete, the components shall be fixed temporarily together in at least two places before grouting. After hardening of the grouting material the fixing shall be removed.

Grouting shall be performed according to the instructions of the manufacturer of the components. The grouting procedure (including e.g. any prewetting of the concrete adjacent to the joint), the recipe, consistency, and the temperature of the grouting material shall be recorded in the test report.

A grouted joint shall be protected against moisture loss under plastic film immediately after grouting and shall be allowed to harden at room temperature for at least 7 d before the test.

5.5 Conditioning of test specimens

The test specimens shall be kept at room temperature before and during testing. The moisture content of the concrete at testing shall be at least 10 % by mass for AAC and at least 5 % by mass for LAC. This shall be checked after the shear test (see 6.2).

NOTE: When in doubt about the moisture content, this can be estimated in advance by testing related samples of material.

6 Testing procedure

6.1 Shear test

Four displacement transducers or dial gauges shall be placed on the upper surface of the test specimen as shown in figure 1 or 2. Two of them shall record the displacements along the joint and the two others the displacement perpendicular to it.

Steel plates for applying the load shall be fixed to the concrete using an intermediate layer of soft fibre board as shown in figures 1 and 2.

A loading frame is placed around the test specimen. The hydraulic jack at one end and the support roller at the opposite end are brought into position taking care that the load axis does not deviate by more than 2 mm from the longitudinal axis of the joint when the load is intended to act parallel with the joint (see figure 1). When the load forms an angle α with the joint (see figure 2), the angular deviation $\Delta\alpha$ between the actual load axis and the intended load axis shall not exceed 0,2° (about 3,5 mm/m).

In case B (see clause 3), additional lateral supports are installed, as shown in figures 1 and 2, preventing in-plane displacements normal to the joint.

It shall be ensured that the supporting rollers are capable of moving smoothly to prevent any significant influence of frictional forces on test results.

After having taken an initial reading of all displacement indicators, the load is applied continuously or in steps, depending on the equipment used for measuring and recording the displacements. In the case of continuous loading, the loading rate shall be chosen such that failure will occur within (10 to 20) min. In the case of incremental load application, the size of the load steps shall not exceed 1/10 of the estimated failure load. Within the individual steps the load may be applied rapidly, but without shock. The displacement gauges shall be read immediately after reaching a new load level and additionally 1 min later under the same load. The procedure shall be repeated until failure occurs. In the case of substantial creep, the load shall be kept constant, and readings shall be taken every other minute until creep ceases, but not longer than 10 min. The formation of cracks or irregularities shall be recorded in the test report.

6.2 Investigations after shear test

Observations on the extent of filling of grouted joints shall be indicated in the test report.

Samples shall be taken from the components in the vicinity of the joint to check the moisture content of the concrete. In the case of AAC this shall be done in accordance with EN 1353. In the case of LAC the procedure described in clause 7 of EN 1356:1996 may be used.

Additional samples shall be taken in order to determine the compressive strength and the dry density of the concrete. They shall be extracted from undamaged parts of the components tested or from a component or block from the same mould or mixer batch as used for the components of the shear test. The compressive strength shall be determined according to EN 679 (AAC) or EN 1354 (LAC). The dry density shall be determined according to EN 678 (AAC) or EN 992 (LAC).

Samples of mortar dowels or of the grouting material shall be taken for the determination of the density, the moisture content and the compressive strength. These properties shall be tested in accordance with relevant or the most appropriate EN test methods.

If it is not possible to determine the compressive strength of the grouting material on test specimens taken from the joints, this shall be done on prisms or cubes cast in moulds using material from the same batch as used for grouting of the joints.

7 Test results

The shear strength of the joint shall be expressed as a force, in kilonewtons.

The result shall be rounded to the nearest 0 or 5 in the third significant figure (e.g. 20,0 kN or 4,05 kN/m).

For each individual test a load-displacement diagram shall be reported.

8 Test report

The test report shall include the following:

a) identification of the components;

b) date of manufacture or other code;

c) place and date of testing, testing institute and person responsible for testing;

d) number and date of issue of this European Standard;

e) description of preparation of test specimens and of loading arrangement, including indication of direction of rise (only for AAC) and of the angle α between the applied load and the joint;

f) drawing of joint, jointing system, load application device, and support conditions (case A or B);

g) (if used) description of the mechanical fixings and their tolerances;

h) recipe and properties of fresh grouting material, if applicable;

i) material specification for mechanical jointing, if applicable;

j) load-displacement diagram for each individual test;

k) failure load for each individual test and mean value for each test set;

l) moisture content of AAC or LAC, respectively;

m) density of AAC or LAC, respectively;

n) compressive strength of AAC or LAC, respectively;

o) properties of hardened grouting material if determined (compressive strength, moisture content, density);

p) observations during and after the test;

q) (if appropriate) deviations from the standard method of testing;

r) a declaration that the testing has been carried out in accordance with this European Standard except as detailed in 8 q).