



# SLOVENSKI STANDARD SIST EN 1170-5:2001

01-april-2001

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## Montažni betonski izdelki - Preskusna metoda za steklocementni kompozit - 5. del: Merjenje upogibne trdnosti, "popolni upogibni preskus"

Precast concrete products - Test method for glass-fibre reinforced cement - Part 5:  
Measuring bending strength, "Complete bending test" method

Vorgefertigte Betonerzeugnisse - Prüfverfahren für Glasfaserbeton - Teil 5: Bestimmung  
der Biegezugfestigkeit, vollständige Biegezugprüfung

Produits préfabriqués en béton - Méthode d'essai des composites ciment-verre - Partie  
5: Mesure de la résistance en flexion, méthode dite Essai complet de flexion

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Ta slovenski standard je istoveten z: EN 1170-5:1997

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### ICS:

91.100.30	Beton in betonski izdelki	Concrete and concrete products
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**en**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
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ICS 91.100.30

Descriptors: concrete products, prefabricated elements, composite materials, cements, glass, verification, conformity tests, bend tests, measurements, flexural strength

English version

Precast concrete products - Test method for glass-fibre reinforced cement - Part 5: Measuring bending strength, "Complete bending test" method

Produits préfabriqués en béton - Méthode d'essai des composites ciment-verre - Partie 5: Mesure de la résistance en flexion, méthode dite "Essai complet de flexion"

Vorgefertigte Betonerzeugnisse - Prüfverfahren für Glasfaserbeton - Teil 5: Bestimmung der Biegezugfestigkeit, vollständige Biegezugprüfung

This European Standard was approved by CEN on 29 October 1997.

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 229 "Precast concrete products", the secretariat of which is held by AFNOR.

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 May 1998, and conflicting national standards shall be withdrawn at the latest by May 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

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## 1 Scope

This European Standard specifies a test method for identifying the stress and deformation performance, at the limit of proportionality and on failure, of a GRC composition subjected to bending.

It is also used to establish, for a given composition of GRC, the relationship between the conventional strength at 28 days and the strength at 7 days (see EN 1170-4).

## 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.

ISO 7500-1	Metallic materials - verification of static uniaxial testing machines - Part 1 : Tensile testing machines
EN 1170-4	Precast concrete products - Test method for glassfibre reinforced cement - Part 4 : Measuring bending strength - "Simplified bending test" method

## 3 Symbols and abbreviation

### 3.1 Symbols

[SIST EN 1170-5:2001](https://standards.iteh.ai/catalog/standards/sist/8e12c986-2bbd-4130-9b10-4c556bdc685d/sist-en-1170-5-2001)

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$b$  : width of test piece, in millimetres ;

$d$  : thickness of test piece in millimetres ;

$F_{LOP}$  : load at limit of proportionality, in newtons ;

$F_{MOR}$  : failure load, in Newtons ;

$l$  : length of test piece, in millimetres ;

$L$  : span, in millimetres ;

$M_d$  : mass of test piece after drying, "dry mass", in grammes ;

$M_W$  : mass of test piece before drying, "wet mass", in grammes ;

$W$  : water content, in percentage by mass ;

$\Delta_{LOP}$  : deflection at limit of proportionality, in millimetres ;

$\Delta_{MOR}$  : deflection at failure in millimetres ;

$\varepsilon_{LOP}$  : stress at limit of proportionality ;

$\epsilon_{MOR}$  : deformation at failure

$\sigma_{LOP}$  : stress at limit of proportionality, in megapascals ;

$\sigma_{MOR}$  : stress at failure, in megapascals.

### 3.2 Abbreviation

**GRC** :Glassfibre reinforced cement.

## 4 Apparatus

The apparatus comprises :

- a bending test machine of accuracy meeting the class 2 requirements specified in ISO 7500-1. It is provided with a four-point bending device (minimum diameter of supports : 6 mm) and a displacement sensor (accurate to 0,01 mm) located preferably in the transverse axis of symmetry of the test device. The test device shall be fitted with a system for plotting the load/deflection curve, either on-line or off-line ;
- two flat, easy to clean, smooth material plates of approximately (500 x 800) mm. In the case of a "pouring" production, provide for a frame having a thickness equal to that of the product being manufactured ;
- a flat-bottomed tank of approximately (500 x 200 x 100) mm filled with water maintained at  $(20 \pm 2)$  °C ;  
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- a rule accurate to 0,5 mm ;
- a calliper accurate to 0,1 mm ;
- a ventilated drying oven adjusted to  $(105 \pm 5)$  °C ;
- a scale with a measuring range 0 kg to 2 kg accurate to 0,1 g.

## 5 Procedure

### 5.1 Test pieces

Consecutively make sample panels on the two flat boards, with no facing layer (solid GRC only) under the same conditions as for the actual production they represent : spray or premix.

After 24 h, demould and store the two sample panels under the same conditions as for the actual production they represent for 6 days.

NOTE : The test pieces can also be cut out on the day of demoulding.

Cut out by sawing in each panel, at  $(50 \pm 1_0)$  mm from the edges, eight test pieces from the positions illustrated in figure 1.

Mark the test pieces as shown in figure 1.

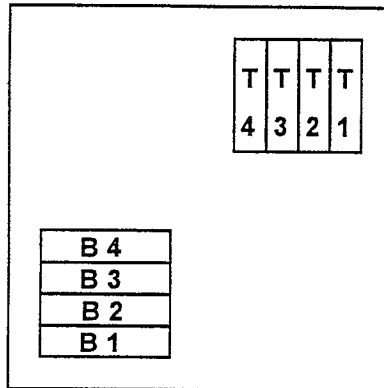


Figure 1 : Position and identification of test pieces

Dimensions of the test pieces :

- width :  $(50 \pm 2)$  mm ;
- length as a function of the thickness, in accordance with table 1.

Table 1 : Length of test pieces as a function of their thickness

Thickness $d$	Dimensions en millimètres			
	$\leq 6,7$	6,8 to 10	10,1 to 12,5	$\geq 12,6$
Length / with a tolerance of $^{+25}_0$ mm	160	225	275	325

The variations in thickness of the test pieces shall not exceed 5% and shall be limited to 0,5 mm. e.g. by grinding

NOTE : The thickness of the test piece may need to be changed to meet this requirement.

Storage of the test pieces :

a) test pieces from the first panel :

When the eight test pieces have been aged for six days, immerse them in the tank filled with water at  $(20 \pm 2)$  °C for 24 h so that they have been aged for seven days at the time of the tests ;

b) test pieces from the second panel :

When the test pieces have been aged for six days, keep them in the laboratory at a temperature of  $(20 \pm 3)$  °C and relative humidity of  $(60 \pm 5)$  % for 21 days so that they have been aged for 27 days. Then immerse them in water at  $(20 \pm 2)$  °C for 24 h for the test at 28 days.

In both cases the test shall be carried out no more than 1/2 h after the test pieces have been removed from the water.

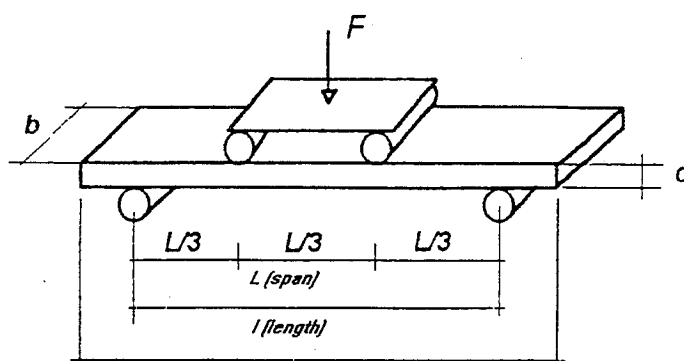


After removal from the water and prior to the test, wipe the test pieces with a damp cloth to remove any surface water.

## 5.2 Test method

Measure the length of each test piece to the nearest millimetre.

Position the test pieces in the testing machine, as shown in figure 2, on the two bottom supports with a span  $L$  between them determined in accordance with table 2.



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Figure 2 Position of test pieces in testing machine

Table 2 : Span of test pieces as a function of their length

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Length $l$	Dimensions in millimetres			
	160	225	275	325
Span $L$	135	200	250	300

For each test panel, the test pieces marked "1" and "3" are tested with the "mould" face down on the two bottom supports and those marked "2" and "4" with the "mould" face in contact with the top supports.

To start the test, adjust the rate of application of the load :

- automatic control by load :  $(10 \pm 0,3)$  N/s ;
- automatic control by displacement :  $(0,03 \pm 0,003)$  mm/s.

NOTE : In order to evaluate correctly the limit of proportionality, the load and displacement sensors should be zeroed at the moment the test piece is in contact with the top supports.

Continue the test until complete failure of the test piece.

Stop recording at  $0,9 F_{MOR}$ .

Measure the thickness and width of the test piece in the failure zone to the nearest 0,1 mm.

Weigh each test piece, i.e.  $m_w$  (in grammes).