

**Provning av fibrer för betong –**  
Del 1: Referensbetong

**Test methods for fibres for concrete –**  
Part 1: Reference concretes

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EUROPEAN STANDARD

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English Version

## Test methods for fibres in concrete - Part 1: Reference concretes

Méthodes d'essai des fibres dans le béton - Partie 1:  
Bétons de référence

Prüfverfahren für Fasern in Beton - Teil 1: Referenzbetone

This European Standard was approved by CEN on 9 June 2007.

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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 CEN Management Centre has the same status as the official versions.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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## **Foreword**

This document (EN 14845-1:2007) has been prepared by Technical Committee CEN/TC 104 "Concrete and related products", 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of an identical text or by endorsement, at the latest by January 2008, and conflicting national standards shall be withdrawn at the latest by May 2008.

It has been drafted by Working Group 11 "Fibres for concrete", the secretariat of which is held by BSI.

This European Standard is one of a series dealing with test methods for assessing the performance of fibres, either steel or polymer, in concrete.

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

## EN 14845-1:2007 (E)

### 1 Scope

This European Standard specifies the composition and characteristics of reference concretes used to evaluate the performance of fibres in concrete.

The purpose of the reference concrete is to determine the general suitability of a fibre for use in concrete.

NOTE The end user needs to satisfy themselves about the effectiveness of the fibre in their own concrete.

### 2 Normative references

The following referenced documents are indispensable for the application 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 197-1:2000, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 206-1:2000, *Concrete — Part 1: Specification, performance, production and conformity*

EN 933-2, *Tests for geometrical properties of aggregates — Part 2: Determination of particle size distribution — Test sieves, nominal size of apertures*

EN 1008, *Mixing water for concrete — Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete*

EN 1766:2000, *Products and systems for the protection and repair of concrete structures — Test methods — Reference concretes for testing*

EN 12350-1, *Testing fresh concrete — Part 1: Sampling*

EN 12350-3, *Testing fresh concrete — Part 3: Vebe test*

EN 12350-4, *Testing fresh concrete — Part 4: Degree of compactability*

EN 14651, *Test method for metallic fibred concrete — Measuring the flexural tensile strength (limit of proportionality (LOP), residual)*

EN 14845-2, *Test methods for fibres in concrete — Part 2: Effect on strength of concrete*

EN 14889-1:2006, *Fibres for concrete — Part 1: Steel fibres — Definitions, specifications and conformity*

EN 14889-2:2006, *Fibres for concrete — Part 2: Polymer fibres — Definitions, specifications and conformity*

### 3 Principle

This European Standard prescribes the constituents and proportions for plain reference concretes to be used to evaluate the performance of fibres in concrete under standard laboratory conditions. It has been developed from EN 1766 and should be read in conjunction with that standard.

The reference concretes shall be designed to meet a prescribed flexural tensile strength, as defined in Table 1.

The performance of a fibre shall be determined in a mandatory 16 mm or 20 mm maximum aggregate size mix using the test method described in EN 14845-2 for the effect on strength of concrete, and by one of the

consistence methods specified in 6.5. There is also the option to evaluate it in any of three additional reference concretes that have different maximum cement content and/or aggregate size.

Tests using reference concretes are performed as comparative tests. That is, the performance of fibres (effect on strength and consistence) is determined by comparing a reference concrete to which fibres are added with the same reference concrete without the addition of fibres, but otherwise with the same aggregate/cement ratio and constituent materials from the same delivery.

## **4 Equipment**

### **4.1 General**

Reference concretes shall be made in accordance with 6.6, using the equipment described in this clause.

### **4.2 Concrete mixer**

A forced action concrete pan-mixer shall be used to mix the concrete.

### **4.3 Moulds**

Moulds for producing hardened concrete specimens, of non absorbent, rigid material, not attacked by cement paste, of a size specified in EN 14845-2 shall be used.

### **4.4 High frequency vibrating table**

Suitable for compaction of the concrete in beam moulds for testing to EN 14845-2.

## **5 Materials**

### **5.1 Aggregates**

Aggregates shall be natural, uncrushed and silica-based with low water absorption (less than 2 % by mass) and oven dried. The aggregate grading, measured according to EN 933-2, shall conform to EN 1766:2000 Annex A, except the limits for a 16 mm or 20 mm aggregate at 0,25 mm shall be 5% to 10 % (not 3 % to 8 %).

### **5.2 Mixing water**

Water according to EN 1008 shall be used.

### **5.3 Cement**

Portland type CEM I class 42,5 R according to EN 197-1:2000 shall be used.

### **5.4 Admixtures**

A plasticizer or superplasticizer admixture according to EN 934-2:2000 may be used to control the workability.

### **5.5 Fibres**

Where fibres are to be evaluated, the fibres shall be sampled in accordance with EN 14889-1:2006, 6.2 for steel fibres or EN 14889-2:2006, 6.2 for polymer fibres.

**EN 14845-1:2007 (E)**

**6 Reference concrete composition and properties**

**6.1 General**

This European Standard specifies four types of reference concrete, defined by the flexural tensile strength, maximum size of the aggregate and maximum cement content. The reference concrete(s) are selected according to the type of product or system in which the fibre is to be applied. However, all fibre manufacturers shall declare the performance of their product, using the test method described in EN 14845-2 for the effect on strength and by one of the methods specified in 6.5 for consistence in the mandatory 16 mm or 20 mm aggregate mix (with a flexural tensile strength of  $4,3 \text{ MPa} \pm 0,3 \text{ MPa}$ ), but have the option to evaluate it in any of three other optional reference concretes that have different maximum cement content and/or aggregate size.

The proportions of the reference concrete shall be adjusted within the limits prescribed below to achieve an average flexural tensile strength within the range defined in Table 1. The average flexural tensile strength shall be taken as the average limit of proportionality of at least twelve beams tested to EN 14651.

**6.2 Water/cement ratio**

The water/cement ratio as defined in EN 206-1 shall be as specified in Table 1.

**Table 1 — W/C ratio and cement content limits**

Flexural tensile strength  (MPa)	Water/cement ratio		Maximum cement content  (kg/m <sup>3</sup> )
	Maximum aggregate size		
	8 mm or 10 mm	16 mm or 20 mm	
$4,3 \pm 0,3$  (25/30) <sup>c</sup>	0,55 <sup>b</sup>	0,55 <sup>a</sup>	350
$5,8 \pm 0,4$  (40/50) <sup>c</sup>	0,45 <sup>b</sup>	0,45 <sup>b</sup>	400
a Mandatory mix. b Optional mixes. c Equivalent compressive class according to EN 1992-1-1.			

**6.3 Maximum cement content**

The maximum cement content shall be as defined in Table 1.