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BRITISH STANDARD

BS EN
13286-40:2003

Unbound and hydraulically bound mixtures —

Part 40: Test method for determination of the direct tensile strength of hydraulically bound mixtures

The European Standard EN 13286-40:2003 has the status of a British Standard

ICS 93.080.20

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National foreword

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The UK participation in its preparation was entrusted by Technical Committee B/510, Road materials, to Subcommittee B/510/4, Cementitious bound materials, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 18 March 2003

Summary of pages

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13286-40

March 2003

ICS 93.080.20

English version

Unbound and hydraulically bound mixtures - Part 40: Test method for the determination of the direct tensile strength of hydraulically bound mixtures

Mélanges traités et mélanges non traités aux liants hydraulique - Partie 40: Méthode d'essai de détermination de la résistance à la traction directe des mélanges traités aux liants hydrauliques

Ungebundene und hydraulisch gebundene Gemische - Teil 40: Prüfverfahren zur Bestimmung der Zugfestigkeit hydraulisch gebundener Gemische im direkten Zugversuch

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Foreword

This document (EN 13286-40:2003) has been prepared by Technical Committee CEN/TC 227 "Road materials", 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of an identical text or by endorsement, at the latest by September 2003, and conflicting national standards shall be withdrawn at the latest by December 2004.

This European Standard is one of a series of standards as listed below.

EN 13286-1, *Unbound and hydraulically bound mixtures — Part 1: Test methods for laboratory reference density and water content — Introduction, general requirements and sampling*.

prEN 13286-2, *Unbound and hydraulically bound mixtures — Part 2: Test methods for laboratory reference density and water content — Proctor compaction.*

EN 13286-3, *Unbound and hydraulically bound mixtures — Part 3: Test methods for laboratory reference density and water content — Vibrocompression with controlled parameters.*

EN 13286-4, *Unbound and hydraulically bound mixtures — Part 4: Test methods for laboratory reference density and water content — Vibrating hammer.*

EN 13286-5, *Unbound and hydraulically bound mixtures — Part 5: Test methods for laboratory reference density and water content — Vibrating table.*

prEN 13286-7, *Unbound and hydraulically bound mixtures — Part 7: Cyclic load triaxial test for unbound mixtures.*

EN 13286-40, *Unbound and hydraulically bound mixtures — Part 40: Test method for the determination of the direct tensile strength of hydraulically bound mixtures.*

EN 13286-41, *Unbound and hydraulically bound mixtures — Part 41: Test method for the determination of the compressive of strength of hydraulically bound mixtures.*

EN 13286-42, *Unbound and hydraulically bound mixtures — Part 42: Test method for the determination of the indirect tensile strength of test specimens.*

EN 13286-43, *Unbound and hydraulically bound mixtures — Part 43: Test method for the determination of the modulus of elasticity of hydraulically bound mixtures.*

prEN 13286-44, *Unbound and hydraulically bound mixtures — Part 44: Test method for the determination of the alpha coefficient of vitrified blastfurnace slag.*

prEN 13286-45, *Unbound and hydraulically bound mixtures — Part 45: Test method for the determination of the workability period of hydraulically bound mixtures.*

EN 13286-46, *Unbound and hydraulically bound mixtures — Part 46: Test method for the determination of the moisture condition value.*

prEN 13286-47, *Unbound and hydraulically bound mixtures — Part 47: Test method for the determination of California bearing ratio, immediate bearing index and linear swelling.*

prEN 13286-48, *Unbound and hydraulically bound mixtures — Part 48: Test method for the determination of the degree of pulverisation.*

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prEN 13286-49, *Unbound and hydraulically bound mixtures — Part 49: Test method for the determination of the accelerated swelling of soil treated by lime and/or hydraulic binder.*

prEN 13286-50, *Unbound and hydraulically bound mixtures —Part 50: Method for the manufacture of test specimens of hydraulically bound mixtures using Proctor equipment or vibrating table compaction.*

prEN 13286-51, *Unbound and hydraulically bound mixtures — Part 51: Method for the manufacture of test specimens of hydraulically bound mixtures using vibrating hammer compaction.*

prEN 13286-52, *Unbound and hydraulically bound mixtures — Part 52: Method for the manufacture of test specimens of hydraulically bound mixtures using vibrocompression.*

prEN 13286-53, *Unbound and hydraulically bound mixtures — Part 53: Method for the manufacture of test specimens of hydraulically bound mixtures using axial compression.*

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

This European Standard specifies a test method for the determination of the direct tensile strength of specimens of hydraulically bound mixtures. This European Standard applies to specimens of hydraulically bound mixture made in accordance with prEN 13286-52.

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).

prEN 13286-52, *Unbound and hydraulically bound mixtures — Part 52: Method for the manufacture of test specimens of hydraulically bound mixtures using vibrocompression.*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1
hydraulically bound mixture
mixture that hardens by hydraulic and/or pozzolanic and/or sulphatic and/or carbonatic reaction, which usually has a workability to suit compaction by rolling and which is generally used in bases, sub-bases and capping layers

3.2
direct tensile strength
stress at failure of a specimen when tested in direct tension

4 Principle

A specimen of hydraulically bound mixtures is subjected to a tensile force until failure (see Figure 1). The direct tensile strength is calculated from the failure load and the diameter of the specimen.

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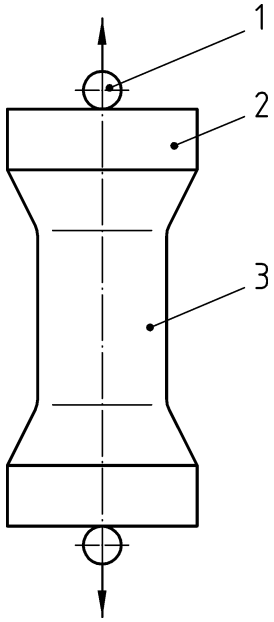

Key

1 Ball joint
2 Steel cap
3 Specimen

Figure 1 — Principle of tensile testing

5 Apparatus

5.1 Direct tensile testing machine, capable of testing direct tensile specimens of hydraulically bound mixtures

The precision of the machine and the load indication shall be such that the ultimate load can be determined and measured to an accuracy of 1 %.

5.2 Steel caps

The diameter of the caps shall be equal to the diameter of the specimen within ± 2 mm and the thickness shall be not less than 20 mm.

5.3 Ball joint

A connection between the testing machine and the caps shall be obtained by a system that avoids a flexural moment in the specimen. A ball joint is suitable.

6 Test specimen

The compaction, shape and dimension of the specimen shall conform to prEN 13286-52 for direct tensile test specimens. The type of curing shall be stated in the test report.

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7 Test procedure

7.1 Preparation of the test specimen

7.1.1 Dimensions

The diameter of the central part of the specimen shall be measured with an accuracy of 0,5 %.

7.1.2 Mass

The specimen shall be weighed to an accuracy of 0,25 %. This shall be compared to the mass at the time of manufacture to ensure that during curing, evaporation has not resulted in a loss of mass greater than 2 %. If the loss is greater than 2 %, this shall be recorded and the resulting tensile strength value may be discarded since it may be unrepresentative.

7.1.3 Steel cap bonding

Before bonding (e.g. by an epoxy resin), the surface of the specimen and caps shall be clean. At bonding, the axes of the specimen and of the two caps shall be aligned to within 1 mm.

NOTE A system of alignment can be necessary to conform with this requirement.

Care shall be taken to avoid loss of water between bonding and tensile strength determination (e.g. by wrapping the specimen in a thin polyethylene film or a wet cloth).

7.2 Positioning the specimen and loading

The specimen shall be placed in the testing machine.

Adjust the testing machine to achieve contact and apply the load in a continuous and uniform manner without shock to obtain a uniform increase in stress of (0,010 0,005) MPa per second.

7.3 Data recording

The maximum force at failure shall be recorded.

Failure of the specimen outside the central part of the specimen shall be stated in the test report.

8 Expression of result

The direct tensile strength of the specimen shall be calculated from the force F using the following formula:

$$R_t = 4F/\ D^2 \qquad (1)$$

where

R_t is the direct tensile strength of the specimen, expressed in Mega Pascal (MPa);

F is the maximum force sustained by the specimen, expressed in newtons (N);

D is the diameter of the central part of the specimen, expressed in millimetres (mm).

The direct tensile strength shall be expressed to the nearest 0,01 N/mm².

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9 Test report

The test report shall refer to this European Standard and shall include the following information:

a) identification of the specimen;

b) condition at time of weighing (as received/saturated - optional);

c) mass of specimen at the time of manufacture to the nearest 10 g;

d) mass of the specimen at the time of test to the nearest 10 g;

e) percentage difference between c) and d); if greater than 2 %, the tensile strength may be invalid and shall be stated;

f) condition of specimen at receipt for storage (if appropriate);

g) method of curing/storage;

h) condition of specimen at time of test (saturated, moist);

i) age of specimen at time of test;

j) date of test;

k) tensile strength of specimen;

l) type of failure;

m) remarks about the operation that does not comply to this European Standard;

n) others remarks.

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