
Unbound and hydraulically bound mixtures —

Part 42: Test method for the
determination of the indirect tensile
strength of hydraulically bound
mixtures

The European Standard EN 13286-42:2003 has the status of a
British Standard

ICS 93.080.20

National foreword

This British Standard is the official English language version of EN 13286-42:2003.

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;
- monitor related international and European developments and promulgate them in the UK.

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English version

Unbound and hydraulically bound mixtures - Part 42: Test
method for the determination of the indirect tensile strength of
hydraulically bound mixtures

Mélanges traités et mélanges non traités aux liants
hydraulique - Partie 42: Méthode d'essai pour la
détermination de la résistance à la traction indirecte des
mélanges traités aux liants hydrauliques

Ungebundene und hydraulisch gebundene Gemische - Teil
42: Prüfverfahren zur Bestimmung der Zugfestigkeit
hydraulisch gebundenen Gemischen im indirekten
Zugversuch

This European Standard was approved by CEN on 29 November 2002.

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 Management Centre or to any CEN member.

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Contents

	page
Foreword.....	3
1 Scope	5
2 Normative references	5
3 Terms and definitions.....	5
4 Principle.....	5
5 Apparatus	6
6 Test specimens.....	7
6.1 Manufacture of test specimen	7
6.2 Shape and dimension.....	7
7 Test procedure.....	7
7.1 Preparation of the test specimen prior to test.....	7
7.1.1 Dimensions.....	7
7.1.2 Mass	7
7.1.3 Parallelism tolerance of the generatrix.....	7
7.2 Specimen positioning.....	7
7.3 Loading	7
7.4 Data recording.....	7
8 Expression of result	7
9 Test report	8

Foreword

This document (EN 13286-42:2003) 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 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 hydraulically bound mixtures.

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.

prEN 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.

EN 13286-42:2003 (E)

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.

1 Scope

This European Standard specifies a test method for the determination of the indirect tensile strength of cylindrical specimens of hydraulically bound mixtures. This European Standard applies to specimens manufactured in the laboratory or prepared from cores.

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 13286-50, 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.

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

indirect tensile strength

stress at failure of a cylindrical specimen subjected to a compression force applied on two opposite generatrix

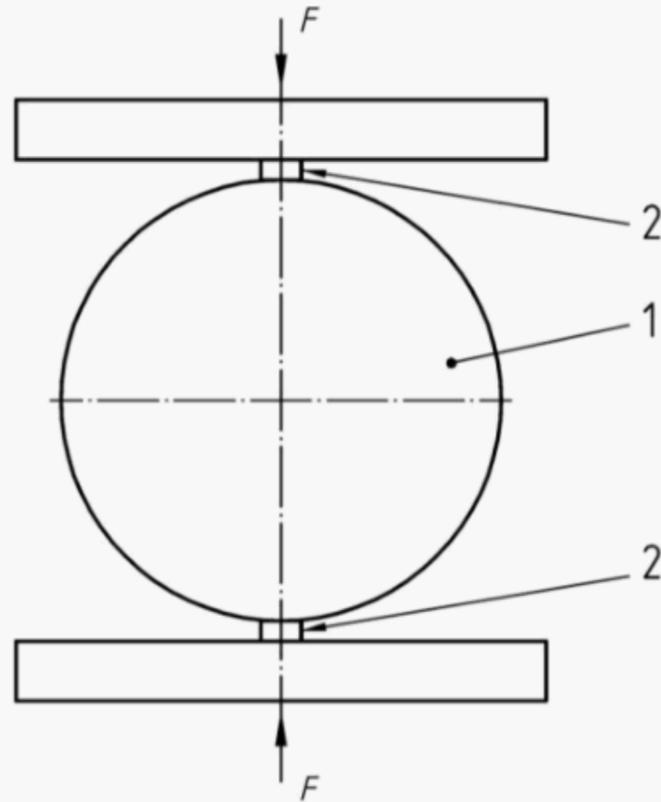
3.3

slenderness ratio

ratio of the length to the diameter of a cylindrical specimen

4 Principle

A cylindrical specimen of hydraulically bound mixtures is subjected to a compression force applied along the two opposite generatrix until failure (see Figure 1). The indirect tensile strength is calculated from the failure load.



- Key**
- 1 Specimen
 - 2 Packing strips
 - F Load

Figure 1 — Principle of indirect tensile test

5 Apparatus

5.1 Compression testing machine, capable of testing hydraulically bound mixtures cylindrical specimens, with the following requirements:

the precision of the machine and the load indication shall be such that the ultimate load, F , can be determined and measured to an accuracy of $\pm 1\%$;

the loading platens shall be at least as large as, and preferably larger than the length of the specimen to which the load is applied. The surface flatness of the platens shall be less than 3%;

provisions shall be made for alignment of specimens at the centre of the lower platens; visual alignment is not acceptable.

5.2 Packing or bearing strip, of plywood or hardboard, which shall be used only once. They shall have the following dimensions according to the dimension of the specimen:

length $\geq h$;

width $\geq 0,1 D$;

thickness (4 ± 1) mm.

6 Test specimens

6.1 Manufacture of test specimen

The specimen shall be manufactured in accordance with prEN 13286-50, prEN 13286-51, prEN 13286-52 or prEN 13286-53. The type of compaction and curing shall be stated in the test report.

6.2 Shape and dimension

The specimen shall be a cylinder with a slenderness ratio between 0,8 and 2,0.

7 Test procedure

7.1 Preparation of the test specimen prior to test

7.1.1 Dimensions

The dimensions 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 $\pm 0,25$ %. This shall be compared to the mass if known at the time of manufacture to ensure that during curing, evaporation has not resulted in loss of mass greater than 2 %. If the loss is greater than 2 %, this shall be recorded and the resulting indirect tensile strength may be discarded since it may be unrepresentative.

7.1.3 Parallelism tolerance of the generatrix

The two opposite generatrix on which the load shall be applied shall have an out parallelism tolerance not exceeding 1 mm in 100 mm. Specimens failing this requirement shall be discarded.

7.2 Specimen positioning

The platens and the surface of the specimens shall be clean.

The specimen and the packing strips shall be located centrally on the platens or on the auxiliary platens with an accuracy of less than 1 mm.

7.3 Loading

Adjust the compression machine to achieve contact and apply the load in a continuous and uniform manner without shock to obtain a uniform increase in stress no greater than 0,2 MPa per second.

7.4 Data recording

The maximum force sustained F shall be recorded.

8 Expression of result

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

$$R_{it} = \frac{2F}{\pi HD} \quad (1)$$

where

R_{it} is the indirect tensile strength, expressed in Mega Pascal (MPa);

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

H is the length of the specimen, expressed in millimetres (mm);

D is the diameter of the specimen; expressed in millimetres (mm).

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

9 Test report

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

- a) identification of the specimen;
- b) dimensions of the specimen;
- c) method of specimen compaction;
- d) condition at time of weighing (as received/saturated - optional);
- e) mass of the specimen at the time of manufacture to the nearest 10 g;
- f) mass of the specimen at the time of test to the nearest 10 g;
- g) percentage difference between f) and d); if greater than 2 %, the indirect tensile strength may be invalid and shall be stated;
- h) condition of specimen at receipt for storage (if appropriate);
- i) method of curing/storage;
- j) condition of specimen at time of test (saturated, moist);
- k) age of specimen at time of test;
- l) date of test;
- m) indirect tensile strength R_{it} of the specimen;
- n) remarks about the operation that does not comply to this European Standard;
- o) other remarks.

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