SLOVENSKI STANDARD
SIST EN 13286-1:2022

01-januar-2022

Nadomešča:
SIST EN 13286-1:2004

Nevezane in hidravlično vezane zmesi - 1. del: Preskusne metode za laboratorijsko referenčno gostoto in vsebnost vode - Uvod, splošne zahteve in vzorčenje

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

Ungebundene und hydraulisch gebundene Gemische - Teil 1: Laborprüfverfahren für die Trockendichte und den Wassergehalt - Einführung, allgemeine Anforderungen und Probenahme

Mélanges traités et mélanges non traités aux liants hydrauliques - Partie 1: Méthode d'essai de détermination en laboratoire de la masse volumique de référence et la teneur en eau - Introduction et exigences générales

Ta slovenski standard je istoveten z: **EN 13286-1:2021**

ICS:

93.080.20	Materiali za gradnjo cest	Road construction materials

SIST EN 13286-1:2022 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13286-1

November 2021

ICS 93.080.20

Supersedes EN 13286-1:2003

English Version

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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-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 13286-1:2021) has been prepared by Technical Committee CEN/TC 227 “Road Materials”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by May 2022, and conflicting national standards shall be withdrawn at the latest by May 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13286-1:2003.

The following changes have been made in comparison with EN 13286-1:2003:

— editorial changes;

— in Table 1, a change to the particle size range for the vibrating hammer test in reflection of the change in EN 13286-4.

This document is one of a series of standards as follows:

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

— EN 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

— EN 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 methods 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 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

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

— EN 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

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

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

— EN 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

— EN 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

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

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

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

— CEN/TS 13286-54, Unbound and hydraulically bound mixtures — Part 54: Test method for the determination of frost susceptibility — Resistance to freezing and thawing of hydraulically bound mixtures

Annex A is informative.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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

1 Scope

This document specifies a number of test methods for the determination of the relationship between the water content and the density of unbound and hydraulically bound mixtures under specified test conditions. The test results provide an estimate of the mixture density that can be achieved and provides a reference parameter for assessing the density of the compacted layer of the mixture.

The test results are used as a basis for specifying requirements for hydraulically bound and unbound mixtures.

The test result also allows a conclusion to be drawn as to the water content at which a mixture can be satisfactorily compacted in order to achieve a given density.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 932-1:1996, *Tests for general properties of aggregates - Part 1: Methods for sampling*

EN 932-2:1999, *Tests for general properties of aggregates - Part 2: Methods for reducing laboratory samples*

EN 932-5, *Tests for general properties of aggregates - Part 5: Common equipment and calibration*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 932-1:1996, EN 932-2:1999 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
laboratory dry density
maximum dry density that can be determined from the dry density/water content relationship derived using a specified test method

3.2
optimum water content
water content associated with the maximum value of laboratory dry density

3.3
aggregate size
designation of aggregate in terms of lower (d) and upper (D) sieve sizes expressed as d/D

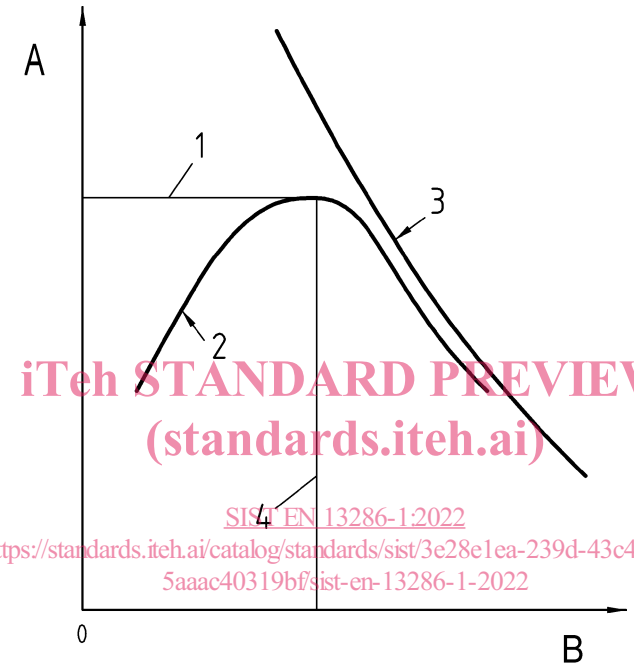
Note 1 to entry: This designation accepts the presence of some particles which will be retained on the upper sieve (oversize) and some which will pass the lower sieve (undersize). The lower sieve size (d) may be zero.

4 Principle

4.1 Relationship between dry density and water content

The solid particles of unbound and hydraulically bound mixtures are compacted, i.e. packed more closely together, thereby increasing the dry density of the mixture. The dry density which can be achieved depends on the effective compaction work applied and on the amount of water present in the mixture.

For a given degree of compaction work applied to a particular mixture, an optimum water content exists at which the dry density obtained reaches a maximum value. These principles are illustrated in Figure 1.



Key

1 Maximum value of laboratory dry density
2 Compaction curve
3 0 % air void line for a given particle density, saturation line
4 Optimum water content
A Dry density, megagrams per cubic metre
B Water content, per cent

Figure 1 — Dry density/water content relationship curve

NOTE 1 The mixtures which are not free draining will, in most cases, establish a well-defined optimum water content and maximum density. However, for free draining mixtures, the laboratory tests will not, in many cases, produce a well-defined water density relationship. The maximum density obtained will generally be less than that obtained in the finished pavement layer.

NOTE 2 For free draining mixtures it is possible to draw two curves: one for the relationship between the dry density and the initial water content (before compaction) and another for the relationship between the dry density and the final water content (after compaction). The possible difference between these curves shows the draining capacity of the mixture.

4.2 Choice of test method

The following four test methods are used for compaction:

— EN 13286-2: Proctor compaction;

— EN 13286-3: Vibrocompression with controlled parameters;

— EN 13286-4: Vibrating hammer;

— EN 13286-5: Vibrating table.

Each method applies different levels of compactive effort, and is suitable for different aggregate sizes.

In the Proctor compaction, vibrocompression and vibrating hammer methods the relationship between the dry density and water content of a mixture is determined.

The Proctor compaction method allows a choice between three mould sizes depending upon aggregate size. Three different hammer masses may be used.

In the vibrating table method the water content of the mixture at this maximum dry density is determined,

NOTE The vibrating table method is suitable for mixtures which drain easily.

The range of applicability of each method is given in Table 1.

Table 1 — Choice of test method

Test method			Particle size range	
Proctor compaction	2,5 kg hammer	100 mm mould	maximum size	16 mm
		150 mm mould	75 to 100 percentage passing	31,5 mm
	4,5 kg hammer	100 mm mould	maximum size	16 mm
		150 mm mould	75 to 100 percentage passing	31,5 mm
	15 kg hammer	250 mm mould	75 to 100 percentage passing	63 mm
Vibrocompression with controlled parameters			maximum size	31,5 mm
Vibrating hammer			90 to 100 percentage passing	40 mm
Vibrating table			maximum size less than 12 percentage passing	80 mm 0,063 mm

4.3 Determination of water content

Where required the water content is determined by oven drying to constant mass using the procedures set out in EN 1097-5.

The minimum size of the test portion used to determine water content is 0,2 × D kg, where D is the aggregate size of the mixture.

If all of a mixture passes the 1 mm sieve, at least 0,2 kg is used.

NOTE It can be convenient to use all the contents of a mould.

The water content of a compacted specimen is determined as soon as possible after completion of compaction.

4.4 Sampling and sample reduction

Sampling and sample reduction are given in EN 932-1 and EN 932-2 with additional requirements given in Annex A.

5 Apparatus

All apparatus shall conform to the general requirements of EN 932-5. Where required, specific requirements for the calibration of particular items of apparatus shall be given in an Annex to the relevant part of the EN 13286 series.

6 Test specimen preparation for other test methods

The methods described in EN 13286-2 to EN 13286-5 may be used to prepare compacted test specimens for use with other test methods.