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Hidravlično vezane zmesi - Specifikacije - 1. del: S cementom stabilizirane mešanice

Hydraulically bound mixtures - Specifications - Part 1: Cement bound granular mixtures

Hydraulisch gebundene Gemische - Anforderungen - Teil 1: Zementgebundene Gemische

Mélanges traités aux liants hydrauliques - Spécifications - Partie 1: Mélanges granulaires traités au ciment

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Hydraulically bound mixtures - Specifications - Part 1: Cement bound granular mixtures

Mélanges traités aux liants hydrauliques - Spécifications -
Partie 1: Mélanges granulaires traités au ciment

Hydraulisch gebundene Gemische - Anforderungen - Teil 1:
Zementgebundene Gemische

This European Standard was approved by CEN on 1 March 2013.

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EN 14227-1:2013 (E)

Foreword

This document (EN 14227-1:2013) 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of an identical text or by endorsement, at the latest by November 2013, and conflicting national standards shall be withdrawn at the latest by November 2013.

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

This document supersedes EN 14227-1:2004.

Compared with EN 14227-1:2004, the following changes have been made:

- Changing of the title;
- Revision of Clause 6 "Hydraulic road binder bound granular mixture";
- Revision of Clause 7 "Laboratory mechanical performance classification";
- Inclusion of Clause 8 "Other requirements for the mixture".

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This standard is one of a series of parts for EN 14227, *Hydraulically bound mixtures— Specifications:*

- *Part 1: Cement bound granular mixtures* [SIST EN 14227-1:2013](https://standards.iteh.ai/catalog/standards/sist/51058f17-b81c-4ac1-bb0c-0cd2a5d88085/sist-en-14227-1-2013)
- *Part 2: Slag bound granular mixtures*
- *Part 3: Fly ash bound granular mixtures*
- *Part 4: Fly ash for hydraulically bound mixtures*
- *Part 5: Hydraulic road binder bound granular mixtures*
- *Part 10: Soil treated by cement*
- *Part 11: Soil treated by lime*
- *Part 12: Soil treated by slag*
- *Part 13: Soil treated by hydraulic road binder*
- *Part 14: Soil treated by fly ash*

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies cement bound granular mixtures for roads, airfields and other trafficked areas and specifies the requirements for their constituents, composition and laboratory performance classification.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 933-1, *Tests for geometrical properties of aggregates — Part 1: Determination of particle size distribution — Sieving method*

EN 1097-6:2000, *Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption*

EN 1097-7, *Tests for mechanical and physical properties of aggregates — Part 7: Determination of the particle density of filler — Pyknometer method*

EN 13242, *Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction*

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 13286-40, *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*

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

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

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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: Methods for the manufacture of test specimens of hydraulically bound mixtures using axial compression*

3 Terms and definitions

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

3.1**hydraulically bound mixture**

mixture which sets and hardens by hydraulic reaction

3.2**cement bound granular mixture**

granular hydraulically bound mixture where cement is the binder

3.3**slenderness ratio**

height to diameter ratio of the specimen

3.4**compacity**

ratio of the absolute volume of the solid to the apparent volume of the mixture (see Annex A)

4 Symbols and abbreviated terms

For the purpose of this document, the following symbols and abbreviated terms apply.

R_c	is the compressive strength, expressed in megapascals (MPa)
R_i	is the compressive strength after immersion, expressed in megapascals (MPa)
R_t	is the direct tensile strength, expressed in megapascals (MPa)
R_{it}	is the indirect tensile strength, expressed in megapascals (MPa)
E	is the modulus of elasticity, expressed in megapascals (MPa)
E_c	is the E determined by compression, expressed in megapascals (MPa)
E_t	is the E determined in direct tension, expressed in megapascals (MPa)
E_{it}	is the E determined in indirect tension, expressed in megapascals (MPa)

5 Constituents

5.1 Aggregates

Aggregates shall be selected from EN 13242.

The properties and the appropriate categories of the aggregates shall be specified depending on the position of the cement bound granular mixture in the pavement structure and the traffic to be carried.

Aggregates shall be volumetrically stable. When this is not the case, the use of the mixture shall be permitted provided there is a satisfactory performance record or a thorough laboratory evaluation of the mixture has been carried out in accordance with provisions valid at the place of use.

5.2 Cement

Cement shall comply with EN 197-1 or a European Technical Approval.

5.3 Water

Water shall not contain components which adversely affect the hardening and the performance of the cement bound granular mixtures.

5.4 Retarders

Retarders shall comply with provisions valid in the place of use.

6 Cement bound granular mixture

6.1 Types

6.1.1 General

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Cement bound granular mixtures shall be made from the constituents specified in Clause 5.

The mixture shall be selected from the five types described in 6.1.2, 6.1.3, 6.1.4, 6.1.5 and 6.1.6, and shall conform to the specified requirements for the selected mixture.

6.1.2 Cement bound granular mixture 1

Cement bound granular mixture 1 shall be either a 0/31,5 mm, a 0/20 mm or a 0/14 mm mixture with a grading, determined in accordance with EN 933-1, complying with the corresponding requirements of Figures 1, 2 and 3 using either G1 or G2 limits.

6.1.3 Cement bound granular mixture 2

6.1.3.1 Description

Cement bound granular mixture 2 shall be a granular mixture with compacity requirement. There are three options depending on the aggregate size.

6.1.3.2 Grading of the mixture

The grading of the selected option, determined in accordance with EN 933-1, shall comply with Table 1. Either category G1 or category G2 of the grading envelopes and Figures 4 to 6 shall be specified.

EN 14227-1:2013 (E)**6.1.3.3 Compacity**

The minimum compacity of the mixture at the maximum modified Proctor dry density shall be 0,80 in accordance with Annex A.

6.1.3.4 Immediate bearing index

The immediate bearing index category of the 0/10 mixture, determined in accordance with EN 13286-47 using modified Proctor compaction, shall be IPI_{50} in accordance with Table 4.

Table 1 — Grading of cement bound granular mixture 2

Column	1	2	3
Line	Cement bound granular mixture	Grading category	Grading envelopes
1	2-0/20	G1 or G2	Figure 4
2	2-0/14	G1 or G2	Figure 5
3	2-0/10	G1 or G2	Figure 6

6.1.4 Cement bound granular mixture 3**6.1.4.1 Description**

Cement bound granular mixture 3 shall be a granular mixture with a maximum nominal size of D equal to or less than 6,3 mm with an immediate bearing index requirement.

6.1.4.2 Grading of the mixture

The grading of the mixture, determined in accordance with EN 933-1, shall comply with Table 2.

Table 2 — Grading of cement bound granular mixture 3

Column	1	2	3	4
Line	Sieve mm	$2D$	D	0,063
1	Percentage of the mixture passing by mass	100	≥ 85	≤ 35

6.1.4.3 Immediate bearing index

The immediate bearing index category shall be selected from Table 4.

6.1.5 Cement bound granular mixture 4

Cement bound granular mixture 4 shall be a mixture where the grading, including declared upper and lower limits, determined in accordance with EN 933-1, is declared by the supplier.

When required, an immediate bearing index category selected from Table 4 shall be declared.

6.1.6 Cement bound granular mixture 5

Cement bound granular mixture 5 shall be a mixture where the grading, determined in accordance with EN 933-1, complies with the limits in Table 3.

When required, an immediate bearing index category selected from Table 4 shall be declared.

Table 3 — Grading of cement bound granular mixture 5

Sieve mm	Percentage passing by mass	
	Minimum	Maximum
45	100	100
31,5	85	100
25	75	100
20	60	100
10	35	100
4	25	100
2	20	100
0,5	13	75
0,25	10	60
0,063	5	25

6.2 Water content of mixtures

The water content shall be selected to permit compaction on site by rolling and to optimise the mechanical performance of the mixture. The water content shall be determined by the Proctor test or other method in accordance with EN 13286-1, EN 13286-2, EN 13286-3, EN 13286-4 and EN 13286-5, and limits set to give a workable range of water content on site compatible with the compaction and the desired mechanical performance of the mixture.

6.3 Proportioning of the constituents, grading and dry density

The proportioning of the constituents, expressed as a percentage by dry mass of the total dry mass of the mixture, the grading, and the dry density of the mixture shall be declared. The declared proportions shall be based on the laboratory mixture design and/or practical experiences with mixtures produced with the same constituents and under the same conditions in a way that the mixture complies with the requirements of this European Standard.

Irrespective of the binder content necessary to fulfil the strength requirements of this European Standard, the binder content should normally not be less than a minimum value fixed by provisions valid at the place of use to ensure adequate distribution of the binder throughout the mixture.

6.4 Other requirements for the fresh mixture

6.4.1 Compacity

The minimum compacity of cement bound granular mixture 2 at the maximum modified Proctor dry density shall be 0,80 calculated in accordance with Annex A (normative).

6.4.2 Immediate bearing index of the mixture

In order to facilitate site compaction and depending on trafficking, the immediate bearing index of the mixture, determined in accordance with EN 13286-47 using modified Proctor compaction

— shall not be less than 50 for cement bound granular mixture 2 – 0/10,

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— shall be selected from Table 4 for cement bound granular mixture 3 and, when required, 4 and 5

Table 4 — Immediate bearing index categories for cement bound granular mixture 3, 4 and 5

Column	1	2
Line	Immediate bearing index requirement	Immediate bearing index, IPI Category
1	Declared value	IPI _{DV}
2	≥ 50	IPI ₅₀
3	≥ 40	IPI ₄₀
4	≥ 25	IPI ₂₅
5	No requirement	IPI _{NR}

Mixtures with an immediate bearing index less than 40 may not support immediate trafficking and should be used with care. Blends of aggregates can be used to achieve the required immediate bearing index.

6.4.3 Workability period

When required for the intended use and the weather conditions, the workability period, determined in accordance with EN 13286-45, shall be declared.

7 Laboratory mechanical performance classification

7.1 General

Laboratory mechanical performance shall be characterised and classified by one of the following methods:

- compressive strength R_C ;
- the combination R_t, E of tensile strength R_t and modulus of elasticity E .

No correlation is intended nor should be assumed between the two methods.

7.2 Classification by compressive strength

Mixtures shall be classified by compressive strength, determined in accordance with EN 13286-41, carried out on specimens manufactured in accordance with EN 13286-50, EN 13286-51, EN 13286-52 and EN 13286-53.

The class of compressive strength shall be selected from Table 5 in combination with the selected method of specimen manufacture.

NOTE The permitted methods of specimen manufacture realise different specimen shapes and density, and thus for the same mixture, different strengths. Hence it is important, on the basis of experience and utilisation, not to separate strength from the method of specimen manufacture.

The age of classification and curing conditions shall be specified in accordance with practice at the place of use.

For characterisation or mixture design testing in the laboratory, compressive strength shall be the average result from at least three specimens. If one value varies by more than 20 % of the average, it shall be discarded and R_C taken as the average of the other values.