



SLOVENSKI STANDARD

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Hidravlično vezane zmesi - Specifikacije - 3. del: Z elektrofiltrskim pepelom vezane zmesi

Hydraulically bound mixtures - Specifications - Part 3: Fly ash bound mixtures

Hydraulisch gebundene Gemische - Anforderungen - Teil 3: Flugaschegebundene Gemische

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Mélanges traités aux liants hydrauliques - Spécifications - Partie 3: Mélanges granulaires traités à la cendre volante

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Hydraulically bound mixtures - Specifications - Part 3: Fly ash bound granular mixtures

Mélanges traités aux liants hydrauliques - Spécifications -
Partie 3: Mélanges granulaires traités à la cendre volante

Hydraulisch gebundene Gemische - Anforderungen - Teil 3:
Flugaschegebundene Gemische

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

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Contents

Page

Foreword.....	4
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
4 Symbols and abbreviated terms	7
5 Constituents	8
5.1 Aggregates	8
5.2 Fly ash.....	8
5.3 Lime.....	8
5.4 Cement.....	8
5.5 Gypsum.....	8
5.6 Granulated blast furnace slag	8
5.7 Other constituents	8
5.8 Water	9
6 Fly ash bound granular mixtures	9
6.1 Types.....	9
6.1.1 Fly ash bound granular mixture 1.....	9
6.1.2 Fly ash bound granular mixture 2.....	9
6.1.3 Fly ash bound granular mixture 3.....	9
6.1.4 Fly ash bound granular mixture 4.....	10
6.1.5 Fly ash bound granular mixture 5.....	10
6.1.6 Fly ash bound granular mixture 6.....	10
6.1.7 Examples of fly ash bound granular mixtures.....	10
6.2 Water content of mixtures	10
6.3 Proportioning of the constituents, grading and dry density.....	11
6.4 Other requirements for the fresh mixture	11
6.4.1 Compacity.....	11
6.4.2 Immediate bearing index of the mixture.....	11
6.4.3 Workability period.....	11
7 Laboratory mechanical performance classification.....	12
7.1 General.....	12
7.2 Classification by compressive strength.....	12
7.3 Classification by R_t , E	13
7.3.1 General.....	13
7.3.2 Method by direct tensile testing.....	14
7.3.3 Method by indirect tensile testing.....	14
7.3.4 Method by indirect tensile and compression testing.....	14
8 Other requirements for the mixture	15
8.1 Strength after immersion in water	15
8.2 Other characteristics	15
9 Production control.....	15
10 Designation and description	15
10.1 Designation	15
10.2 Description	16
11 Marking and labelling	16
12 Figures	17
Annex A (normative) Compacity of a fly ash bound granular mixture 2.....	26

Annex B (informative) Examples of fly ash bound granular mixtures using siliceous fly ash	27
Annex C (informative) Examples of fly ash bound granular mixtures using calcareous fly ash	28
Annex D (informative) Production control for fly ash bound granular mixtures	29
D.1 General	29
D.2 Quality manual	29
D.3 Organisation	29
D.3.1 Responsibility and authority	29
D.3.2 Management representative	29
D.3.3 Internal audits	29
D.3.4 Management review	30
D.3.5 Sub-contract services	30
D.3.6 Records	30
D.3.7 Training	30
D.4 Control procedures	30
D.4.1 Production management	30
D.4.2 Composition of the mixture	31
D.4.3 Constituents	31
D.4.4 Process control	31
D.4.5 Inspection, calibration and control of process equipment	31
D.4.6 Handling and delivery	32
D.5 Inspection and testing of constituents and mixtures during production	32
D.5.1 General	32
D.5.2 Characteristics that require control during production	32
D.5.3 Frequency of sampling the mixture	32
D.6 Inspection and testing equipment	33
D.6.1 General	33
D.6.2 Measuring and testing equipment	33
D.6.3 Measuring and testing equipment in the process	33
D.6.4 Measuring and testing equipment in laboratory	33
D.7 Non-conformity	34
D.7.1 General	34
D.7.2 Non-conformity of constituents	34
D.7.3 Non-conformity of the mixture	34
Bibliography	35

EN 14227-3:2013 (E)**Foreword**

This document (EN 14227-3:2013) 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 14227-3:2004.

Compared with EN 14227-3:2004, the following changes have been made:

- Changing of the title;
- Revision of Clause 5 "Constituents";
- Revision of Clause 6 "Fly ash bound granular mixture";
- Inclusion of Clause 6.4 "Other requirements for the fresh mixture";
- Revision of Annex B (informative) "Examples of fly ash bound granular mixtures using siliceous fly ash";
- Revision of Annex C (informative) "Examples of fly ash bound granular mixtures using calcareous fly ash".

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

- *Part 1: Cement bound granular mixtures*
- *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*

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EN 14227-3:2013 (E)**1 Scope**

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

In this European Standard, fly ash refers to siliceous or calcareous fly ash complying with EN 14227-4. Where fly ash is part of cement conforming to EN 197-1 or hydraulic road binder conforming to EN 13282-1 and EN 13282-2, then reference should be made to EN 14227-1 or EN 14227-5 respectively.

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 459-1, *Building lime — Part 1: Definitions, specifications and conformity criteria*

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*

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*

EN 14227-2, *Hydraulically bound mixtures — Specifications — Part 2: Slag bound granular mixtures*

EN 14227-4, *Hydraulically bound mixtures — Specifications — Part 4: Fly ash for hydraulically bound mixtures*

3 Terms and definitions

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

3.1 hydraulically bound mixture [\(standards.iteh.ai\)](https://standards.iteh.ai)

mixture which sets and hardens by hydraulic reaction

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3.2 fly ash bound granular mixture <https://standards.iteh.ai/catalog/standards/sist/07af9e78-133d-4b16-a3c6-bc4daffc4e3c/sist-en-14227-3-2013>

granular hydraulically bound mixture in which siliceous or calcareous fly ash is the essential constituent of the binder and the hydraulic reaction

Note 1 to entry: Hardening can be controlled by additional constituents.

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);

EN 14227-3:2013 (E)

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 fly ash bound 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 Fly ash

Siliceous or calcareous fly ash shall conform to EN 14227-4.

5.3 Lime

Quick lime (CaO) or hydrated lime [Ca(OH)₂] shall be type CL90 or CL80 in conformity with EN 459-1.

Quick lime shall comply with reactivity R4 or R5 and particle size distribution P1, P2, P3 or P4.

5.4 Cement

Cement shall conform to EN 197-1.

5.5 Gypsum

The percentage of CaSO₄·2H₂O in gypsum shall exceed 90 %. The maximum size shall be less than 5 mm.

NOTE 1 Gypsum, natural or artificial, is a setting and hardening activator.

NOTE 2 Unless the constituents and the mixture are well known and proven, it will be necessary to check the expansion of mixtures containing gypsum.

5.6 Granulated blast furnace slag

Granulated, including partially ground and ground granulated blast furnace slag, shall conform to EN 14227-2.

5.7 Other constituents

Constituents, including calcium chloride and sodium carbonate, can be used to enhance the setting and hardening of fly ash bound mixtures.

5.8 Water

Water shall not contain components that adversely affect the hardening and performance of the fly ash bound mixture.

6 Fly ash bound granular mixtures

6.1 Types

Fly ash bound granular mixture shall be made from the constituents specified in Clause 5.

The mixture shall be selected from the six types described below and shall conform to the specified requirements for the selected mixture.

6.1.1 Fly ash bound granular mixture 1

The grading of the mixture shall be 0/31,5 mm, determined in accordance with EN 933-1 and shall comply with Figure 1 for mixture using siliceous fly ash and Figure 2 for mixture using calcareous fly ash.

6.1.2 Fly ash bound granular mixture 2

Granular mixture with a compacity requirement.

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

Either category G1 or category G2 of the grading envelope in Figures 3 to 8 shall be specified.

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

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

Table 1 — Grading of fly ash bound granular mixture 2

Fly ash bound granular mixture	Grading category	Grading envelopes	
		Mixture using siliceous fly ash	Mixture using calcareous fly ash
2-0/20	G1 or G2	Figure 3	Figure 4
2-0/14	G1 or G2	Figure 5	Figure 6
2-0/10	G1 or G2	Figure 7	Figure 8

6.1.3 Fly ash bound granular mixture 3

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

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

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

EN 14227-3:2013 (E)

Table 2 — Grading of fly ash bound granular mixture 3

Sieve mm	2D	D	0,063
Percentage passing by mass	100	≥ 85	≤ 35

6.1.4 Fly ash bound granular mixture 4

Granular mixture with supplier declared grading, including declared upper and lower limits, and supplier declared immediate bearing index category.

The grading of the mixture shall be determined in accordance with EN 933-1.

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

6.1.5 Fly ash bound granular mixture 5

The grading of the mixture when tested in accordance with EN 933-1 shall comply with the limits in Table 3.

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

Table 3 — Grading of fly ash bound granular mixture 5

Sieve mm	45	31,5	20	10	4	2	0,5	0,25	0,063
Percentage passing by mass	100	85 to 100	66 to 100	48 to 100	34 to 100	26 to 100	16 to 75	13 to 60	7 to 35

SIST EN 14227-3:2013

6.1.6 Fly ash bound granular mixture 6

Fly ash bound mixture 6 shall be a mixture where fly ash is the main constituent of the mixture and part of the binder.

Unless the constituents and the mixture are well known and proven, the mixture shall be checked for volume stability in accordance with regulations at the place of use.

In the case of lime and gypsum activated siliceous fly ash, the proportion of gypsum shall not exceed 7 % by dry mass and the proportion of lime shall not exceed 5 % by mass, in the case of quick lime (CaO), or 7 % by mass in the case of hydrated lime (Ca(OH)₂).

6.1.7 Examples of fly ash bound granular mixtures

Annexes B and C give examples of fly ash bound granular mixtures.

NOTE The examples are not exhaustive, nor the proportions intended to be restrictive, but they illustrate the current use in Europe.

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.