



SLOVENSKI STANDARD
SIST EN 14227-14:2006
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Hydraulically bound mixtures - Specifications - Part 14: Soil treated by fly ash

Hydraulisch gebundene Gemische - Anforderungen - Teil 14: Bodenverbesserung mit
Flugasche

Mélanges traités aux liants hydrauliques - Specifications - Partie 14: Sol traité a la
cendre volante

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English Version

Hydraulically bound mixtures - Specifications - Part 14: Soil treated by fly ash

Mélanges traités aux liants hydrauliques - Spécifications -
Partie 14: Sol traité à la cendre volante

Hydraulisch gebundene Gemische - Anforderungen - Teil
14: Bodenverbesserung mit Flugasche

This European Standard was approved by CEN on 3 February 2006.

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 Central Secretariat or to any CEN member.

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 Central Secretariat has the same status as the official versions.

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Foreword

This European Standard (EN 14227-14:2006) 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of an identical text or by endorsement, at the latest by November 2006, and conflicting national standards shall be withdrawn at the latest by November 2006.

This European Standard is one of a series of standards for hydraulically bound mixtures:

EN 14227-1, *Hydraulically bound mixtures — Specifications — Part 1: Cement bound granular mixtures.*

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

EN 14227-3, *Hydraulically bound mixtures — Specifications — Part 3: Fly ash bound mixtures.*

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

EN 14227-5, *Hydraulically bound mixtures — Specifications — Part 5: Hydraulic road binder bound mixtures.*

EN 14227-10, *Hydraulically bound mixtures — Specifications — Part 10: Soil treated by cement.*

EN 14227-11, *Hydraulically bound mixtures — Specifications — Part 11: Soil treated by lime.*

EN 14227-12, *Hydraulically bound mixtures — Specifications — Part 12: Soil treated by slag.*

EN 14227-13, *Hydraulically bound mixtures — Specifications — Part 13: Soil treated by hydraulic road binder.*

EN 14227-14, *Hydraulically bound mixtures — Specifications — Part 14: Soil treated by fly ash.*

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

1 Scope

This European Standard specifies soils treated by fly ash for roads, airfields and other trafficked areas and specifies the requirements for their constituents, composition and laboratory performance classification.

This European Standard covers soils treated by siliceous or calcareous fly ash conforming to EN 14227-4.

It does not cover soils treated by fly ash as part of cement or hydraulic road binder conforming to EN 197-1 or ENV 13282, requirements for which are given in EN 14227-10 and EN 14227-13 respectively.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. 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, *Test for geometrical properties of aggregates — Part 1: Determination of particle size distribution — Sieving method*

EN 13286-2, *Unbound and hydraulically bound mixtures — Part 2: Test methods for the determination of the 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 13286-46, *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 the 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: Accelerated swelling test for 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*

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

EN 14227-11, *Hydraulically bound mixtures — Specifications — Part 11: Soil treated by lime*

3 Terms and definitions

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

3.1 fly ash
siliceous or calcareous fly ash produced from the combustion of pulverized coal in energy generating plants

3.2 soil
natural, artificial or recycled material or any combination of these

3.3 soil treated by fly ash
mixture of fly ash, soil, other constituents, and water that sets and hardens by hydraulic reaction

3.4 slenderness ratio
height to diameter ratio of the specimen

4 Symbols and abbreviated terms

For the purpose of this European Standard, the following symbols and abbreviations apply.

- W is the water content;
- P is the pulverization;
- IPI is the immediate bearing index;
- MCV is the moisture condition value;
- CBR is the California bearing ratio, expressed in percent (%);
- R is the compressive or tensile strength, expressed in megapascals (MPa);
- R_c is the compressive strength, 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);
- R_i is the compressive or tensile strength after immersion in water, expressed in megapascals (MPa);
- E is the modulus of elasticity, expressed in megapascals (MPa);
- E_c is the modulus of elasticity E determined in compression, expressed in megapascals (MPa);
- E_t is the modulus of elasticity E determined in direct tension, expressed in megapascals (MPa);
- E_{it} is E determined in indirect tension, expressed in megapascals (MPa);
- I is the 'strength after immersion' ratio;
- LS is the linear swelling of a CBR specimen, expressed in millimetres (mm);
- G_v is the volumetric swelling of a specimen, expressed in percent (%).

5 Constituents

5.1 Siliceous or calcareous fly ash

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

5.2 Soil

Not less than 95 % of the soil shall pass the 63 mm sieve when tested using wet sieving in conformity with EN 933-1.

The soil shall conform to classification and homogeneity requirements at the place of use.

NOTE 1 Organic matter can delay the setting and hardening process. Laboratory mixture design work will determine whether soil containing organic matter can be accommodated. The amount of organic matter that can be accommodated depends on the type of organic matter.

NOTE 2 Soil containing or suspected of containing sulphates can result in expansion of the mixture. Laboratory mixture design work including 'resistance to water testing' in accordance with this European Standard will determine if sulfates or other material with the potential to cause swelling can be accommodated.

5.3 Water

Water shall not adversely affect the setting, hardening and performance of the mixture.

5.4 Other constituents

Other constituents shall include lime in conformity with EN 14227-11, cement in conformity with EN 197-1, aggregate, gypsum or other materials that are either necessary for hydraulic reaction or to improve workability, traffickability or performance.

NOTE Siliceous fly ash requires lime or a source of lime (e.g. cement) to produce a hydraulic reaction.

6 Mixture

6.1 General

The mixture shall comprise constituents specified in Clause 5.

6.2 Proportioning and dry density

The proportioning of the constituents including water content, expressed as percentages by dry mass of the total dry mass of the mixture, 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.

7 Requirements for the fresh mixture

7.1 Water content

The water content shall be selected to permit compaction on site and to optimize the mechanical performance of the mixture. The water content shall be determined by the Proctor or other tests in conformity with EN 13286-2 to EN 13286-5 and limits set that give a workable range on site compatible with the compaction and desired performance of the mixture.

When required, the water content of the mixture shall comply with the selected category from Table 1.

Table 1 — Minimum water content categories

Minimum water content	Category
0,9 optimum water content of the mixture determined in accordance with the selected method of compaction from EN 13286-2 to EN 13286-5	W _{0,9}
0,95 optimum water content of the mixture determined in accordance with the selected method of compaction from EN 13286-2 to EN 13286-5	W _{0,95}
The optimum water content of the mixture determined in accordance with the selected method of compaction from EN 13286-2 to EN 13286-5	W _{1,0}
Declared value	W _{DV}

7.2 Degree of pulverization

When required, the degree of pulverization of the mixture, determined in accordance with EN 13286-48, shall conform to one of the categories in Table 2.

Table 2 — Degree of pulverization

Degree of pulverization	Category
≥ 30 %	P ₃₀
≥ 40 %	P ₄₀
≥ 50 %	P ₅₀
≥ 60 %	P ₆₀
Declared value	P _{DV}

7.3 Immediate bearing index

When required, the immediate bearing index of the mixture at the declared water content, determined in accordance with EN 13286-47, shall conform to one of the categories in Table 3 observing the following testing procedure. After mixing, the mixture shall be stored in bags in a sealed condition for 60 min. The specimen(s) shall then be manufactured and the determination of the index carried out immediately or no later than 90 min after mixing.

Table 3 — Immediate bearing index

Immediate bearing index	Category
≥ 10	IPI ₁₀
≥ 15	IPI ₁₅
≥ 20	IPI ₂₀
≥ 25	IPI ₂₅
≥ 30	IPI ₃₀
≥ 40	IPI ₄₀
≥ 50	IPI ₅₀
Declared value	IPI _{DV}

7.4 Moisture condition value

When required, the moisture condition value of the mixture, determined in accordance with EN 13286-46, shall conform to one of the categories in Table 4.

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Table 4 — Moisture condition value

Moisture condition value	Category
6 minimum, 10 maximum	MCV _{6/10}
7 minimum, 11 maximum	MCV _{7/11}
8 minimum, 12 maximum	MCV _{8/12}
9 minimum, 13 maximum	MCV _{9/13}
Declared values	MCV _{DV}

8 Laboratory mechanical performance classification

8.1 General

The laboratory mechanical performance of the mixture shall be characterized and classified by one of the following three methods:

- by California bearing ratio CBR;
- by compressive strength R_c ;
- by the combination R_t , E of tensile strength R_t and modulus of elasticity E .

NOTE No correlation is intended nor should be assumed between the three methods of characterization.