



SLOVENSKI STANDARD
SIST EN 14227-4:2005
01-januar-2005

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Hydraulically bound mixtures - Specifications - Part 4: Fly ash for hydraulically bound mixtures

Hydraulisch gebundene Gemische - Anforderungen - Teil 4: Flugasche für hydraulisch gebundene Gemische

Mélanges traités aux liants hydrauliques - Spécifications - Partie 4: Cendre volante pour mélanges traités aux liants hydrauliques

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Ta slovenski standard je istoveten z: EN 14227-4:2004

ICS:

93.080.20 Materiali za gradnjo cest Road construction materials

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 14227-4

July 2004

ICS 93.080.20

English version

Hydraulically bound mixtures - Specifications - Part 4: Fly ash for hydraulically bound mixtures

Mélanges traités aux liants hydrauliques - Spécifications -
Partie 4: Cendre volante pour mélanges traités aux liants
hydrauliques

Hydraulisch gebundene Gemische - Anforderungen - Teil 4:
Flugasche für hydraulisch gebundene Gemische

This European Standard was approved by CEN on 16 April 2004.

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.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Foreword

This document (EN 14227-4:2004) 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 January 2005, and conflicting national standards shall be withdrawn at the latest by January 2005.

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

prEN 14227-1, *Unbound and hydraulically bound mixtures — Specifications — Part 1: Cement bound granular mixtures*

prEN 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*

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

prEN 14227-11, *Unbound and hydraulically bound mixtures — Specifications — Part 11: Soil treated by lime*

prEN 14227-12, *Unbound and hydraulically bound mixtures — Specifications — Part 12: Soil treated by slag*

prEN 14227-13, *Unbound and hydraulically bound mixtures — Specifications — Part 13: Soil treated by hydraulic road binder*

prEN 14227-14, *Unbound and 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, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EN 14227-4:2004 (E)**1 Scope**

This European Standard specifies siliceous and calcareous fly ash used in hydraulically bound mixtures for roads, airfields and other trafficked areas. This European standard applies to fly ash produced by the combustion of pulverized coal or lignite in energy generating plants.

2 Normative references

The following referenced documents are indispensable for the application 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 196-2, *Methods of testing cement — Part 2: Chemical analysis of cement*

EN 196-3, *Methods of testing cement — Part 3: Determination of setting time and soundness*

EN 196-6:1989, *Methods of testing cement — Part 6: Determination of fineness*

EN 196-7, *Methods of testing cement — Part 7: Methods of taking and preparing samples of cement*

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 451-1, *Method of testing fly ash — Part 1: Determination of free calcium oxide content*

EN 451-2, *Method of testing fly ash — Part 2: Determination of fineness by wet sieving*

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

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3 Terms and definitions

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

3.1**fly ash**

fine powder produced by the combustion of pulverized coal or lignite in energy generating plants and captured by mechanical or electrostatic precipitators

3.2**siliceous fly ash (alumino-silicate fly ash)**

fly ash where the essential chemical components are silicates, aluminates and iron oxides, expressed as SiO_2 , Al_2O_3 and Fe_2O_3 and which has pozzolanic properties

NOTE It may be stored, supplied and used either in a wet or dry condition.

3.3**calcareous fly ash (sulfo-calcitic fly ash)**

fly ash where the essential chemical components are silicates, aluminates, calcium oxide and sulfates, expressed as SiO_2 , Al_2O_3 , CaO and SO_3 and which has hydraulic and pozzolanic properties

NOTE It is stored and supplied in a dry condition.

3.4**pozzolanic material**

material which mixed with lime $[\text{Ca}(\text{OH})_2 \text{ or } \text{CaO}]$ in the presence of water sets and hardens to form stable and durable compounds

3.5**hydraulic material**

material which sets and hardens in the presence of water, to form stable and durable compounds

3.6**dry fly ash**

fly ash with a very low water content, see 4.2.5 and 4.3.4

NOTE Normally supplied directly from dry storage.

4 Requirements**4.1 General**

Chemical characteristics shall be expressed as a percentage by mass of the dry product which is obtained by drying a laboratory sample in a well ventilated oven at $(105 \pm 5) ^\circ\text{C}$ to constant mass, and allowed to cool in a dry atmosphere.

For dry fly ash, samples shall be taken and prepared in accordance with EN 196-7. For wet fly ash, samples shall be taken and prepared in accordance with EN 13286-1.

4.2 Requirements for siliceous fly ash**4.2.1 Particle size**

The grading shall conform to Table 1.

Sieving shall be carried out in accordance with EN 451-2.

Table 1 — Grading of siliceous fly ash

Column	1	2
Line	Sieve	Percentage passing by mass
1	90 μm	≥ 70
2	45 μm	≥ 40

4.2.2 Loss on ignition

The loss on ignition measured in accordance with EN 196-2, but using an ignition time of 1 h, or equivalent method, shall not exceed 10,0 % by mass.

NOTE The purpose of this requirement is to limit the residue of unburned carbon in fly ash. It is sufficient, therefore, to show through direct measurement of unburned carbon residue, that it is less than the value specified above.

EN 14227-4:2004 (E)**4.2.3 Sulphuric anhydride**

The content of sulphuric anhydride, SO₃ shall be determined in accordance with EN 196-2 and shall not be greater than 4,0 % by mass.

4.2.4 Free calcium oxide and soundness

If the free calcium oxide content, measured in accordance with EN 451-1, exceeds 1,0 % by mass, soundness shall be measured according to EN 196-3 and the expansion shall not exceed 10 mm with a 30:70 blend of fly ash and cement.

4.2.5 Water content

Dry siliceous fly ash shall contain not more than 1,0 % by mass of water.

NOTE Siliceous fly ash may be stored, used and supplied either in a wet or a dry condition.

4.2.6 Pozzolanic activity of siliceous fly ash

If required at the place of use, the pozzolanic activity shall be declared. This is generally determined by the measurement of compressive strength development over time of mixtures of lime, fly ash and a standard aggregate.

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4.3 Requirements for calcareous fly ash**4.3.1 Particle size**

The grading shall conform to Table 2. Sieving shall be carried out in accordance with EN 196-6:1989, clause 3.

Table 2 — Grading of calcareous fly ash

Column	1	2
Line	Sieve	Percentage passing by mass
1	315 µm	≥95
2	90 µm	≥70

4.3.2 Soundness

The expansion of calcareous fly ash shall be less than 10 mm, when tested in accordance with EN 196-3, using a mixture of 30 % by mass of ground fly ash and 70 % by mass of reference cement.

4.3.3 Reactive calcium oxide

The total value of reactive CaO determined in accordance with EN 197-1 shall not be less than 5 % by mass.

4.3.4 Water content

Dry calcareous fly ash shall contain not more than 1 % by mass of water. Calcareous fly ash shall be stored and supplied in a dry condition.