



Date 2003-04-25	CEN/TC 227 N 989 "Road materials"
--------------------	--

prEN 14227-4
for approval for FV



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 — Specifications — Partie 4 : Cendre volante pour mélanges traités aux liants hydrauliques

Proposed for formal vote 11/03/2003

ICS:

Descriptors:

Contents

Foreword	3
1 Scope	3
2 Normative references	3
3 Terms and definitions	4
4 Requirements	5
5 Production control	7
6 Marking and labelling	7

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 227 "Road materials", the secretariat of which is held by DIN.

According to CEN/CENELEC internal regulations, the national standards organisations of the following countries are bound to implement this document: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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

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

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

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

prEN 14227-5, *Hydraulically bound mixtures — Specifications — Part 5: Granular materials bound with hydraulic road binders.*

prEN 14227-X, *Hydraulically bound mixtures — Specifications — Part X: Soil cement.*

prEN 14227-11, *Hydraulically bound mixtures — Specifications — Part 11: Lime treated mixtures.*

prEN 14227-12, *Hydraulically bound mixtures — Specifications — Part 12: Soil treated by granulated blast furnace slag.*

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

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

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

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to 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, *Methods of testing cement — Part 6: Determination of fineness.*

EN 196-7, *Methods of testing cement — Part 7: Determination of strength.*

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria.*

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

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

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

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 can 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 [$\text{Ca}(\text{OH})_2$ or 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 ± 5) °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 prEN 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

Sieve	Percentage passing by mass
90 μm	≥ 70
45 μm	≥ 40

4.2.2 Loss on ignition

The loss on ignition measured in accordance with EN196-2, 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.

4.2.3 Sulfuric anhydride

The content of sulfuric anhydride, SO_3 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 can 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.

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, clause 3.

Table 2 — Grading of calcareous fly ash

Sieve	Percentage passing by mass
315 μm	≥ 95
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.

4.3.5 Hydraulic activity of calcareous fly ash

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

5 Production control

Fly ash shall be controlled according to table 3. The producer shall establish and maintain a production control manual setting out the procedures by which the requirements for production control are satisfied.

Table 3 — Production control

Property	Minimum test frequency ¹⁾	Clause reference	
		siliceous fly ash	calcareous fly ash
Particle size	2 per month or 1 per 5.000 tonnes	4.2.1	4.3.1
Loss on ignition	2 per month or 1 per 5.000 tonnes	4.2.2	n.a.
sulfuric anhydride	1 per month or 1 per 10.000 tonnes	4.2.3	n.a.
Free calcium oxide	1 per month or 1 per 10.000 tonnes	4.2.4	n.a.
Soundness ²⁾	1 per month or 1 per 10.000 tonnes	4.2.4	4.3.2
Reactive calcium oxide	1 per month or 1 per 10.000 tonnes	n.a.	4.3.3
Water content	2 per month or 1 per 5.000 tonnes	4.2.5	4.3.4
Pozzolanic activity ²⁾	2 per year or 1 per 50.000 tonnes	4.2.6	n.a.
Hydraulic activity ²⁾	2 per year or 1 per 50.000 tonnes	n.a.	4.3.5

n.a.: not applicable

¹⁾ Which ever is more frequent

²⁾ If required

6 Marking and labelling

The delivery ticket shall contain at least the following:

- a) the type of fly ash and the number of this European Standard;
- b) the origin;
the producer.