SLOVENSKI STANDARD
SIST EN 14227-1:2005

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Hidravliļ no vezane zmesi ï Specifikacije ï 1. del: S cementom stabilizirane meġanice za vezane spodnje nosilne plasti

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 traitées au ciment

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ICS:

93.080.20 Materiali za gradnjo cest Road construction materials

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EUROPEAN STANDARD

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

Mélange à base de liants hydrauliques et mélanges non traités - Spécifications - Partie 1: Mélanges granulaires liés au ciment pour assises de chaussées

Ungebundene und hydraulisch gebundene Gemische - Anforderungen - Teil 1: Zementgebundene Gemische für hydraulisch gebundene Tragschichten mit Zement (HGT)

This European Standard was approved by CEN on 13 May 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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Contents

page

Foreword

This document (EN 14227-1:2004) 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 European Standard specifies technical requirements for cement bound mixtures of natural, artificial and recycled aggregates mixed with cement as the principle binder to be used for construction and maintenance of roads, airfields and other trafficked areas.

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.*

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

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

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

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.

1 Scope

This document specifies requirements, test methods and compliance criteria for cement bound granular mixtures used for construction and maintenance of roads, airfields and other trafficked areas.

This document specifies the characteristics of cement bound granular mixtures (CBGM) by reference to the properties of their constituents, the mixture and the properties of specimens of the mixed materials.

NOTE In addition to conforming to the requirements of this document cement bound granular mixture may have other requirements, not included in this document, which may be required by national regulation. The additional requirements may include any requirements selected from the following:

— frost damage resistance;

— compacity (as defined in EN 14227-2);

— workability period (measured in conformity with EN 13286-45);

— immediate bearing index (measured in conformity with EN 13286-47);

— such other requirements as are referred to within this document, as being the subject of national regulations.

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

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

EN 934-2, *Admixtures for concrete, mortar and grout — Part 2: Concrete admixtures — Definitions, requirements, conformity, marking and labelling.*

EN 1008, *Mixing water for concrete — Specifications for sampling, testing and assessing the suitability of water, including water recovered from process in the concrete industry, as mixing water for concrete.*

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

ENV 13282, *Hydraulic road binders — Composition, specifications and conformity criteria.*

EN 13285, *Unbound mixtures — Specification.*

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 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.*

prEN 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.*

prEN 13286-51, *Unbound and hydraulically bound mixtures — Part 51: Method for the manufacture of test specimens of hydraulically bound mixtures vibrating hammer compaction.*

prEN 13286-52, *Unbound and hydraulically bound mixtures — Part 52: Method for the manufacture of test specimens of hydraulically bound mixtures by vibrocompression.*

prEN 13286-53, *Unbound and hydraulically bound mixtures — Part 53: Method for the manufacture of test specimens of hydraulically bound mixtures by axial compression. .*

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

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

3 Terms and definitions

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

3.1
cement bound granular mixture (CBGM)
hydraulically bound granular mixture with an aggregate of a controlled grading and with cement or with type E hydraulic road binder as the binder, mixed using a technique that provides a homogeneous mixture

3.2
job standard mix
mixture being considered for a specific production quantity and/or a specific paving project, for compaction at a defined density, established by an appropriate design procedure which will ensure conformity of the mix to this document

NOTE The design procedure should be based on laboratory – and/or site – trials using constituents from the same sources and with the same properties as are to be used in the production quantity or project.

4 Symbols and abbreviations

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

CBGM is the cement bound granular mixture;

GGBS is the ground granulated blast furnace slag;

HRB is the hydraulic road binder;

R_t is the direct tensile strength of hardened specimen, in megapascals (MPa);

R_{it} is the indirect tensile strength of hardened specimen, in megapascals (MPa);

E is the modulus of elasticity of hardened specimen, in megapascals (MPa);

R_{ck} is the characteristic compressive strength, in megapascals (MPa);

R_{tk} is the characteristic direct tensile strength, in megapascals (MPa);

R_{itk} is the characteristic indirect tensile strength, in megapascals (MPa);

R_{cs} is the compressive strength of the job standard mix, in megapascals (MPa).

5 Requirements for constituent materials

5.1 General

The constituent materials for cement bound granular mixture shall be defined in terms of their properties.

NOTE Some of the requirements are of principle nature to provide an appropriate long-term strength and durability of the cement bound granular mixture. Some are supplementary to provide for specific conditions in some places of application in Europe.

5.2 Binder

Cement shall conform to EN 197-1.

Hydraulic road binder used for cement bound granular mixture shall conform to ENV 13282, strength class HRB 22,5 E or HRB 32,5 E.

NOTE The cement bound granular mixture strength classes in 6.5.2.2 and 6.5.2.3 assume the use of cement conforming to EN 197-1 CEM 1, Class 32,5N, 42,5N or 52,5N cement. Where it is proposed to use other classes of binder and the pavement design assumes an age of other than 28 days then the mixture strength requirement at 28 days may be adjusted to assure that the strength, and elastic modulus (where appropriate) characteristics of the proposed mixture will be the equivalent at the required design age of that obtained from the same mixture using EN 197-1 CEM 1 32,5N, 42,5N or 52,5N cement. The establishment of the necessary correlation, where necessary, should form part of the job standard mix design procedure. For first approximation purposes the following relationships have been found to hold with common CEM 1 (N grade) cements: R_c^{28}/R_c^{360} = 0,60; R_t^{28}/R_t^{360} = 0,60 and E^{28}/E^{360} = 0,65, where the superscripts represent the age at test, in days, when specimens have been cured at 20 °C.

5.3 Aggregate

5.3.1 Type of aggregate

The aggregates shall comply with EN 13242. They shall be either crushed or uncrushed or a combination of both. They shall be of the following type:

a) naturally occurring or artificial aggregate, or

b) recycled construction aggregate, or

c) a combination of a) and b). The chosen proportions shall be specified in the contract and maintained to a tolerance of ± 5 % by mass related to the declared proportions.

5.3.2 Grading curve of the aggregate

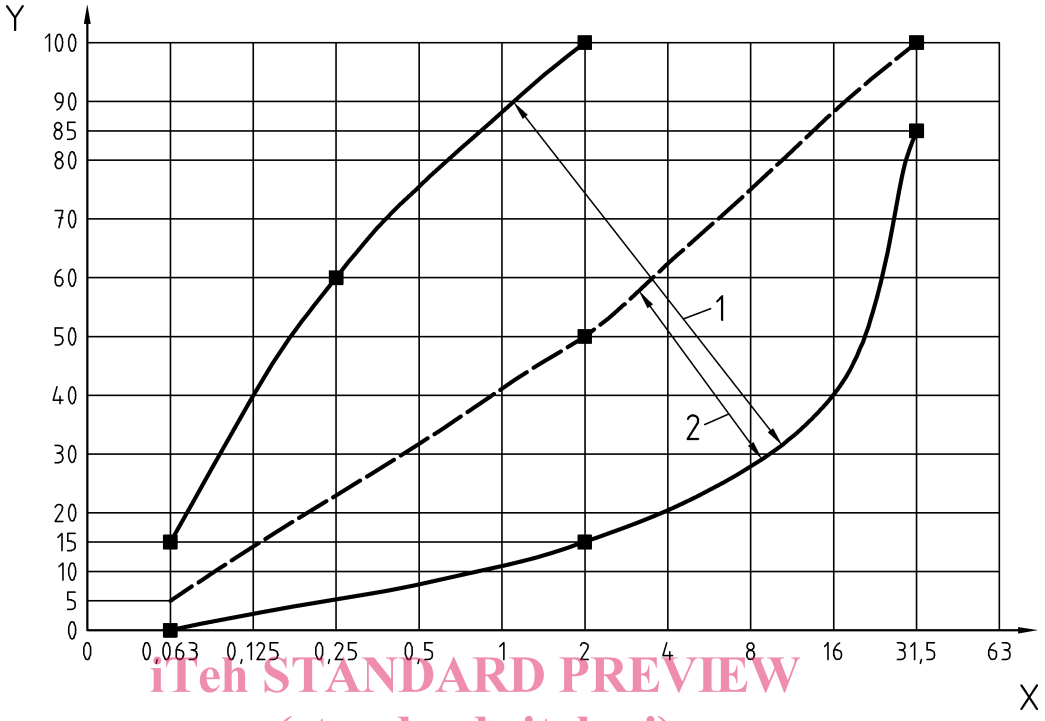
The aggregate grading for a specific mixture shall be selected within the envelope of Figure 1. This aggregate grading shall be used to establish the job standard mix.

NOTE 1 The envelope in Figure 1 may further be limited taking into account the rules in use at the place of use, e.g. by national regulations. Annex B gives examples of grading limits which have been found to be appropriate in some locations.

NOTE 2 The envelope in Figure 1 covers all gradings with which practical experience in cement bound granular mixture exist. The sub-envelopes A and B are informative only. Gradings characterised by envelope A include sands, which have been found in some locations to be able to be successfully compacted and capable of fulfilling the requirements of this document. Grading classified by envelope B includes well-graded coarse aggregates with limited contents of fines <0,063 mm.

NOTE 3 Soils and aggregates not included in the envelope in Figure 1 may be used for soil cement in compliance with prEN 14227-10.

During production the specified grading of the aggregate shall be kept sufficiently consistent to fulfil the grading tolerances of the cement bound granular mixture.



Key

Y Percentage passing by mass
X Sieve size, in millimetre (mm)
1 Envelope A
2 Envelope B

Figure 1 — Aggregate grading

5.3.3 Harmful fines

The aggregate shall not contain harmful fines in a quantity that affects the hardening, the strength or the durability of the mixture.

5.4 Additions

If ground granulated blast furnace slag is used, it shall conform to a European Technical Approval or to national regulations. It shall also be incorporated in the design of the job standard mix.

Where fly ash is to be used it shall be part of a blended cement conforming to EN 197-1. Mixtures containing cement and fly ash, which is added on site during or immediately prior to mixing with the aggregate, shall conform to EN 14227-3.

5.5 Mixing water

The mixing water shall conform to EN 1008.

5.6 Admixtures

Admixtures shall conform to EN 934-2.

If accelerators or retarders are used, they shall be incorporated into the mix design.

6 Classification of cement bound granular mixture and requirements for the mixture

6.1 General

Systems for the classification of cement bound granular mixture shall be defined and requirements for fresh and hardened cement bound granular mixtures shall be specified in terms of their cement content, the water content strength and/or elastic modulus of the hardened mixture. Strength and elastic modulus requirements shall be defined by the test specimen shape and by the methods of specimen manufacture, curing and testing.

The cement content and the water content of the mixture shall be related to the total mass of the dry material i.e.: aggregate + cement + additions = 100 %.

6.2 Binder content

The binder content of the mixture (job standard mix) shall be determined by a design procedure and/or experience with mixtures produced using its proposed constituents. Design procedures shall conform to national regulations or to provisions valid at the place of use.

The binder content shall not be less than the minimum binder content in Table 1.