



**SLOVENSKI STANDARD**  
**SIST EN 14227-11:2006**  
**01-julij-2006**

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Hydraulically bound mixtures - Specifications - Part 11: Soil treated by lime

Hydraulisch gebundene Gemische - Anforderungen - Teil 11: Bodenverbesserung mit Kalk

Mélanges traités aux liants hydrauliques - Spécifications - Partie 11: Sol traité à la chaux

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**Ta slovenski standard je istoveten z: EN 14227-11:2006**

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English Version

## Hydraulically bound mixtures - Specifications - Part 11: Soil treated by lime

Mélanges traités aux liants hydrauliques - Spécifications -  
Partie 11: Sol traité à la chaux

Hydraulisch gebundene Gemische - Anforderungen - Teil  
11: Bodenverbesserung mit Kalk

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.

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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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**Contents**

Page

Foreword.....	4
1 Scope .....	5
2 Normative references .....	5
3 Terms and definitions .....	5
4 Constituents .....	6
4.1 Lime.....	6
4.1.1 Quick lime.....	6
4.1.2 Hydrated lime .....	7
4.2 Water .....	7
4.3 Soil .....	7
4.3.1 Soil for improvement by lime .....	7
4.3.2 Soil for stabilization by lime .....	7
5 Laboratory performance for soil improved by lime .....	7
5.1 General.....	7
5.2 Immediate bearing index.....	7
5.3 Moisture condition value.....	8
5.4 Degree of compaction.....	8
5.5 Swelling .....	8
6 Laboratory performance for soil stabilized by lime .....	9
6.1 Degree of pulverization .....	9
6.2 Water content .....	9
6.3 Immediate bearing index.....	9
6.4 Moisture condition value .....	10
6.5 Mechanical performance.....	10
6.5.1 General.....	10
6.5.2 California bearing ratio .....	10
6.5.3 Compressive strength.....	11
6.6 Swelling .....	11
6.6.1 General.....	11
6.7 Frost resistance .....	12
7 Production control.....	12
8 Designation and description .....	12
9 Marking and labelling .....	13
Annex A (informative) Grading and plasticity guidance for soil for stabilization.....	14
Annex B (informative) Production control for hydraulically treated mixtures .....	15
B.1 General.....	15
B.2 Quality Manual .....	15
B.3 Organization.....	15
B.3.1 Responsibility and authority .....	15
B.3.2 Management representative .....	15
B.3.3 Internal audits .....	16
B.3.4 Management review.....	16
B.3.5 Sub-contract services .....	16
B.3.6 Records.....	16
B.3.7 Training.....	16
B.4 Control procedures.....	16

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SIST EN 14227-11:2006

<http://standards.iteh.ai/catalog/standards/sist/90a4de9c-7c62-4eb7-985b-0672d97ab2a9/sist-en-14227-11-2006>

B.4.1	Production management .....	16
B.4.2	Composition of the mixture .....	17
B.4.3	Constituents .....	17
B.4.4	Process control .....	17
B.4.5	Inspection, calibration and control of process equipment .....	18
B.4.6	Handling and delivery .....	18
B.5	Inspection and testing of constituents and mixtures during production .....	18
B.5.1	General .....	18
B.5.2	Characteristics that require control during production .....	18
B.5.3	Frequency of sampling the mixture .....	19
B.6	Inspection and testing equipment .....	19
B.6.1	General .....	19
B.6.2	Measuring and testing equipment .....	19
B.6.3	Measuring and testing equipment in the process .....	19
B.6.4	Measuring and testing equipment in laboratory .....	20
B.7	Non-conformity .....	20
B.7.1	General .....	20
B.7.2	Non-conformity of constituents .....	20
B.7.3	Non-conformity of the mixture .....	20

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SIST EN 14227-11:2006

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## Foreword

This European Standard (EN 14227-11:2006) 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 applies to the treatment with lime of natural soils and other materials for roads, airfields and other trafficked areas and specifies the requirements for their constituents, composition and laboratory performance classification.

Two types of treatment are covered, improvement and stabilization.

This European Standard relates only to lime-treated layers for trafficked areas (as opposed to lime columns or piles for example) but can be used for other civil engineering purposes although additional requirements might be necessary to complement or replace those required by this European Standard.

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

EN 459-2, *Building lime — Part 2: Test methods*

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 13286-41, *Unbound and hydraulically bound mixtures — Part 41: Test method for the determination of the compressive strength 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*

## 3 Terms and definitions

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

### 3.1

#### lime

air lime

### 3.2

#### soil

natural, artificial or recycled material or any combination of these

**3.3 soil treated by lime**

mixture resulting from the addition of lime to a soil in order that it can fulfil its intended purpose

NOTE Treatment encompasses both improvement and stabilization.

**3.4 soil improved by lime**

mixture resulting from the treatment of a soil with lime which improves immediate performance by, for example, either a reduction in moisture content, and/or enhancement of bearing capacity, and/or reduction in plasticity, to enable the soil to provide one or more of the following:

- ability to be handled by conventional earthmoving equipment;
- ability to be satisfactorily compacted in layers;
- ability to be trafficked and provide a working platform for the superimposed layer;
- preparation of a soil for the subsequent treatment by slag, fly ash, cement, hydraulic road binder or other product

**3.5 soil stabilized by lime**

mixture resulting from the treatment of a soil with lime that significantly enhances, generally in the medium to long-term, its mechanical performance and stability, particularly with respect to the action of water and frost

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**4 Constituents**

**4.1 Lime**

[SIST EN 14227-11:2006](https://standards.iteh.ai/catalog/standards/sist/90a4de9c-7c62-4eb7-985b-0672d97ab2a9/sist-en-14227-11-2006)

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Lime shall be quick lime or hydrated lime. [0672d97ab2a9/sist-en-14227-11-2006](https://standards.iteh.ai/catalog/standards/sist/90a4de9c-7c62-4eb7-985b-0672d97ab2a9/sist-en-14227-11-2006)

NOTE Hydrated lime may be used dry or in slurry form.

**4.1.1 Quick lime**

Quick lime shall conform to EN 459-1, class CL 90 or CL 80, and the following.

When tested in accordance with EN 459-2, the particle size of the quick lime shall conform to the selected category from Table 1.

**Table 1 — Particle size categories for quick lime**

Sieve size mm	Category 1	Category 2
10	100	100
5	100	≥ 95
2	≥ 95	—
0,2	≥ 70	—
0,09	≥ 50	—



When tested in accordance with the reactivity test in EN 459-2, the quick lime shall attain a temperature of 60 °C within 25 min.

NOTE 1 In the case of quick limes containing material greater than 2 mm in size, the proportion retained on the 2 mm sieve should be ground down to finer than 2 mm for inclusion in the test.

The mixing process shall ensure that full slaking of the quick lime occurs prior to final compaction.

NOTE 2 In the case of category 1 particle size and provided sufficient water is present, full slaking is normally possible after just one mixing stage. In the case of category 2, full slaking, again provided sufficient water is present, may require 2 or more mixing stages separated by a period of at least 24 h.

#### 4.1.2 Hydrated lime

Hydrated lime shall conform to EN 459-1, class CL 90 or CL 80.

### 4.2 Water

The water used shall not adversely affect the performance of the mixture.

### 4.3 Soil

#### 4.3.1 Soil for improvement by lime

The soil shall be suitable for treatment using common processes and equipment.

NOTE There are no physical requirements for soil prior to improvement other than the practical limits set by the capabilities of the mixer for the improvement operation, although the presence of sulfates or other substances with the potential for disruption by swelling may require investigation using testing in accordance with this European Standard.

#### 4.3.2 Soil for stabilization by lime

The soil shall not contain sulfates or other potentially disruptive material that, after lime addition, result in swelling of the mixture in excess of that allowed by Clause 6.

NOTE 1 There are no absolute requirements for the grading or plasticity of soil prior to stabilization but guidance is given in Annex A.

NOTE 2 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 its type.

## 5 Laboratory performance for soil improved by lime

### 5.1 General

Soil improved by lime shall conform to one of the categories in either 5.2, 5.3 or 5.4 for immediate bearing index, moisture condition value and degree of compaction respectively.

### 5.2 Immediate bearing index

When required, the immediate bearing index of the mixture at the declared water content shall conform to one of the classes in Table 2 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 2 — Immediate bearing index

Immediate bearing index	Category
≥ 5	IPI <sub>5</sub>
≥ 7	IPI <sub>7</sub>
≥ 10	IPI <sub>10</sub>
≥ 15	IPI <sub>15</sub>
≥ 20	IPI <sub>20</sub>
≥ 25	IPI <sub>25</sub>
Declared value	IPI <sub>DV</sub>

**5.3 Moisture condition value**

The moisture condition value of the mixture, determined in accordance with EN 13286-46, shall conform to the selected category from Table 3.

Table 3 — Moisture condition value

Moisture condition value	Category
8 minimum, 12 maximum	MCV <sub>8/12</sub>
Declared values	MCV <sub>DV</sub>

NOTE The moisture condition value test is particularly suitable for cohesive soils.  
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**5.4 Degree of compaction**

The degree of compaction of the mixture shall conform to the selected category from Table 4.

Table 4 — Degree of compaction

The ratio in % of the in situ dry density to the Proctor (see NOTE) dry density determined in accordance with EN 13286-2	Category
≥ 95	DC <sub>95</sub>
≥ 97	DC <sub>97</sub>
Declared value	DC <sub>DV</sub>

NOTE Proctor refers to an energy level of approximately 0,6 MJ/m<sup>3</sup> conforming to EN 13286-2.

**5.5 Swelling**

Depending on the application, the swelling of the mixture shall be examined using either volumetric swelling or linear swelling described in 6.6.

NOTE In the case of examination using linear swelling, the specified limits in 6.6, which relate to lime – stabilized mixture, may require modification to suit the application of the lime-improved mixture.

## 6 Laboratory performance for soil stabilized by lime

### 6.1 Degree of pulverization

When required, the degree of pulverization of the mixture, determined in accordance with EN 13286-48, shall conform to the selected category of Table 5.

**Table 5 — Degree of pulverization**

Degree of pulverization	Category
≥ 30 %	P <sub>30</sub>
≥ 40 %	P <sub>40</sub>
≥ 50 %	P <sub>50</sub>
≥ 60 %	P <sub>60</sub>
Declared value	P <sub>DV</sub>

### 6.2 Water content

When required, the water content of the mixture shall conform to the selected category from Table 6.

**Table 6 — Water content**  
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Minimum water content of the mixture	Category
0,9 optimum water content of the mixture determined in accordance with Proctor compaction in EN 13286-2	W <sub>0,9</sub>
The optimum water content of the mixture determined in accordance with Proctor compaction in EN 13286-2	W <sub>1,0</sub>
Declared value	W <sub>DV</sub>
NOTE Proctor refers to an energy level of approximately 0,6 MJ/m <sup>3</sup> conforming to EN 13286-2.	

### 6.3 Immediate bearing index

When required, the immediate bearing index of the mixture at the declared water content shall conform to one of the categories in Table 7 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 7 — Immediate bearing index**

Immediate bearing index	Category
≥ 10	IPI <sub>10</sub>
≥ 15	IPI <sub>15</sub>
≥ 20	IPI <sub>20</sub>
≥ 25	IPI <sub>25</sub>
Declared value	IPI <sub>DV</sub>