

**SLOVENSKI STANDARD**  
**oSIST prEN 13282-2:2010**  
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**Hidravlična veziva za ceste - 2. del: Hidravlična veziva za ceste, ki se normalno strjujejo - Sestava, zahteve in merila skladnosti**

Hydraulic road binders - Part 2: Normal hardening hydraulic road binders - Composition, specifications and conformity criteria

Hydraulische Tragschichtbinder - Teil 2: Normal erhärtende hydraulische Tragschichtbinder - Zusammensetzung, Anforderungen und Konformitätskriterien

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

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## Hydraulic road binders - Part 2: Normal hardening hydraulic road binders - Composition, specifications and conformity criteria

Hydraulische Tragschichtbinder - Teil 2: Normal erhärtende hydraulische Tragschichtbinder - Zusammensetzung, Anforderungen und Konformitätskriterien

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 51.

If this draft becomes a European Standard, 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.

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## Foreword

This document (prEN 13282-2:2010) has been prepared by Technical Committee CEN/TC 51 “Cement and building limes”, the secretariat of which is held by NBN.

This document is currently submitted to the CEN Enquiry.

This document will supersede ENV 13282:2000.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU directive(s), see informative annex ZA which is an integral part of this standard.

The European Standard EN 13282 for hydraulic road binders consists of the following parts :

Part 1 : Rapid hardening hydraulic road binders – Composition, specifications and conformity criteria

Part 2 : Normal hardening hydraulic road binders – Composition, specifications and conformity criteria

Part 3 : Conformity evaluation

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## Introduction

Depending on the local experience and availability of products and materials, different binders are used for roadbases and sub-bases, capping layers, soil stabilization and soil improvement in Europe. These include cements conforming to EN 197-1 and EN 197-4, building limes conforming to EN 459-1 and hydraulic road binders presently defined in existing national standards or technical approvals.

Hydraulic road binders are finished products, produced in a factory and supplied ready for use. They are differentiated according to their strength development in normal hardening hydraulic road binders specified in this standard and rapid hardening hydraulic road binders specified in EN 13282-1. The Part 3 of EN 13282 defines the conformity evaluation procedure for hydraulic road binders according to this standard.

Binders obtained through mixing of their constituents on site are not covered by this European Standard.

Cements, masonry cements and building limes are also outside the scope of this European Standard, as they are defined in specific European Standards.

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## 1 Scope

EN 13282-2 defines and gives the specifications for normal hardening hydraulic road binders, produced in a factory and supplied ready for treatment of materials for bases, sub-bases and capping layers as well as earthworks, in road, railway, airport and other types of infrastructures. They are classified according to their compressive strength at 56 days. It specifies their mechanical, physical and chemical requirements, together with the conformity criteria and evaluation procedures to be applied by the manufacturer.

## 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 197-1 Cement – Part 1: Composition, specifications and conformity criteria for common cements

EN 197-4 Cement – Part 4: Composition, specifications and conformity criteria for low early strength blastfurnace cements

EN 459-1 Building lime - Part 1: Definitions, specifications and conformity criteria

EN 459-2 Building lime - Part 2: Test methods

EN 196-1 Methods of testing cement - Part 1: Determination of strength

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: Methods of taking and preparing samples of cement

EN 13282-1 Hydraulic road binders– Part 1: Rapid hardening hydraulic road binders

EN 13282-3 Hydraulic road binders – Part 3: Conformity evaluation

EN 451-1 Methods of testing fly ash – Part 1: Determination of available lime content

ISO 10694 Soil quality - Determination of organic and total carbon after dry combustion (elementary analysis)

## 3 DEFINITIONS

For the purposes of this European Standard, the following definitions apply :

### 3.1 autocontrol testing

continual testing by the manufacturer of normal hardening hydraulic road binder spot samples taken at the point(s) of release from the factory/depot

**prEN 13282-2:2010 (E)****3.2 control period**

period of production and dispatch identified for the evaluation of the autocontrol test results

**3.3 characteristic value**

value of a required mechanical, physical or chemical property outside of which lies a specified percentage, the percentile  $P_k$ , of all the values of the population

**3.4 specified characteristic value**

characteristic value of a mechanical, physical or chemical property which in the case of an upper limit is not to be exceeded or in the case of a lower limit is, as a minimum, to be reached

**3.5 single result limit value**

value of a mechanical, physical or chemical property which – for any single test result – in the case of an upper limit is not to be exceeded or in the case of a lower limit is, as a minimum, to be reached

**3.6 allowable probability of acceptance**

for a given sampling plan, the allowed probability of acceptance of a normal hardening hydraulic road binder with a characteristic value outside the specified characteristic value

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**4 HYDRAULIC ROAD BINDER**

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**4.1 General**

A hydraulic binder, when mixed with water, hardens both in the air and under water and remains solid, even under water.

A hydraulic road binder is a factory produced hydraulic binder, supplied ready for use, having properties specifically suitable for treatment of materials for bases, sub-bases and capping layers as well as earthworks, in road, railway, airport and other types of infrastructures.

NOTE 1: Hydraulic road binders are not only used for road construction but this general designation will be used for a better understanding in this document.

A hydraulic road binder consists of a powder made from a blend of different constituents and statistically homogeneous in composition. A high degree of uniformity in all properties shall be obtained through continuous mass production processes.

NOTE 2: Continuous production refers to the process, the definition of the product, its composition and properties but does not imply a 24 hour production.

Qualified and skilled personnel and the facilities to test, evaluate and adjust product quality are essential for producing normal hardening hydraulic road binders included in this European Standard.

The manufacturing process and its control shall ensure that the composition of a normal hardening hydraulic road binder is kept within the limits fixed in this European Standard.

**4.2 Normal hardening hydraulic road binder**

A normal hardening hydraulic road binder is a hydraulic road binder which conforms to the requirements for strength at 56 days, fineness, initial setting time, soundness and sulfate content.



## 5 CONSTITUENTS

### 5.1 Main constituents

The main constituents of a normal hardening hydraulic road binder are those in a proportion over 10 % by mass. They shall be selected from the following list:

- constituents which conform to the main constituents defined in EN 197-1:
- Portland cement clinker (K);
- granulated blastfurnace slag (S);
- pozzolanic materials : natural pozzolanas (P) and natural calcined pozzolanas (Q) ;
- fly: siliceous fly ash (V) and calcareous fly ash (W);
- burnt shale (T);
- limestone (L,LL);
- fly ash: siliceous fly ash of circulating fluidised bed (Va) and unslaked calcareous fly ash (Wa):
- siliceous fly ash of circulating fluidised bed (Va) resulting from coal combustion in accordance with the following characteristics:
  - $(\text{SiO}_2) + (\text{Al}_2\text{O}_3) + (\text{Fe}_2\text{O}_3) \geq 70 \%$ ;
  - available lime  $< 2 \%$ ;
  - reactive silica  $\geq 20 \%$ ;
  - $\text{SO}_3 < 6 \%$ ;
  - passing  $315 \mu\text{m} = 100 \%$ ;

unslaked calcareous fly ash (Wa) containing at least 15 % reactive calcium oxide (CaO) measured according to EN 451-1, to be used only as a constituent of normal hardening hydraulic road binders of classes N1 and N2.

The loss on ignition of fly ash (V,W,Va,Wa) determined in accordance with EN 196-2, but using an ignition time of 1 h, or the content of unburnt carbon determined in accordance with ISO 10694 shall not exceed 9,0 % by mass.

- crystallised basic oxygen furnace slag (Sb) resulting from the transformation of pig iron into steel through an oxygen treatment process, in accordance with the following characteristics:

- total CaO  $> 40 \%$ ;
- $(\text{SiO}_2) + (\text{Al}_2\text{O}_3) + (\text{Fe}_2\text{O}_3) > 40 \%$ ;
- MgO  $< 9 \%$ ;
- available lime from 7 % to 15 % determined in accordance with EN 459-2;
- $\text{SO}_3 < 0,3 \%$ ;
- Soundness of ground basic oxygen furnace slag (Blaine fineness  $> 2000 \text{ cm}^2/\text{g}$ )  $< 30 \text{ mm}$  according to EN 196-3.

**prEN 13282-2:2010 (E)**

Crystallised basic oxygen furnace slag (Sb) can be added to the other constituents of the normal hardening hydraulic road binder during its manufacture. The declared value shall be less than 40 %.

- calcium lime (CL) and natural hydraulic lime (NHL) which conform to EN 459-1. CL limes may be either quick lime (CL-Q) or hydrated lime (CL-S).

**5.2 Minor additional constituents**

Minor additional constituents (Mac) can be added in a proportion not exceeding 10 % by mass in total.

Minor additional constituents are specially selected, inorganic natural mineral materials, inorganic mineral materials derived from the clinker or calcium lime production process, or constituents as specified in 5.1 unless they are included as main constituents which, after appropriate preparation and on account of their particle size distribution, improve the physical properties of the binder (such as workability or water retention). They can be inert or have slightly hydraulic, latent hydraulic or pozzolanic properties. However, no requirements are set for them in this respect.

Minor additional constituents shall be correctly prepared, i.e. selected, homogenized, dried and comminuted depending on their state of production or delivery.

Minor additional constituents shall not impair the properties of the binder.

**5.3 Calcium sulfate (Cs)**

Calcium sulfate, gypsum, hemihydrate or anhydrite (natural or artificial) can be added to the other constituents of the normal hardening hydraulic road binder during its manufacture.

**5.4 Additives**

Additives, for the purpose of this European Standard, are constituents not covered in 5.1 to 5.3 which are added to improve the manufacture or the properties of the normal hardening hydraulic road binder.

The total quantity of additives, excluding water, should not exceed 1 % by mass of the binder.

A total content of additives over 1 % by mass is permitted provided that quantity and function of each of them are stated on the packaging and/or on the delivery note.

Additives shall not impair the properties of the normal hardening hydraulic road binder.

**6 CLASSIFICATION**

Normal hardening hydraulic road binders are designated by the letter N followed by a number representing the strength class.

The strength class of a normal hardening hydraulic road binder shall be determined by the compressive strength at 56 days tested in accordance with EN 196-1.

Four strength classes are defined in this European Standard: N 1, N 2, N 3 and N 4 (see § 7.1).

NOTE : Strength classes are incorporated to enable the manufacturer to control quality and are not related to the mechanical performance of soils or other materials treated with normal hardening hydraulic road binders.

## 7 REQUIREMENTS

### 7.1 Mechanical requirements

The compressive strength of normal hardening hydraulic road binders shall be determined in accordance with EN 196-1, the cement being replaced by the normal hardening hydraulic road binder.

If the HRB contains calcium quick lime (CL-Q) as main constituent, the available lime of the HRB sample shall be slaked before testing according to the slaking procedure described in annex A.

The prisms shall be produced, stored and tested as specified in EN 196-1, unless otherwise specified below.

NOTE: In case of slaked HRBs, the mortar may present a dry to very dry aspect. Whatever the mortar aspect the prisms shall be produced as specified in EN 196-1.

The prisms shall be removed from the mould 24 h after preparation and then stored, pending the test, at a relative humidity of not less than 90 %.

Should it not be possible to remove the prisms from the mould after 24 h, it is permitted to remove them at a later age, and this age shall be stated in the test report.

When using moist air storage boxes the prisms shall not be allowed to come into contact with the water poured into the boxes up to a level of about 10 mm. The lid shall close tightly and any felt seals shall be kept damp.

Normal hardening hydraulic road binders shall comply with the requirements of Table 1.

**Table 1 : Mechanical requirements**

Class	Compressive strength in MPa at 56 days	
N 1	$\geq 5$	$\leq 22,5$
N 2	$\geq 12,5$	$\leq 32,5$
N 3	$\geq 22,5$	$\leq 42,5$
N 4	$\geq 32,5$	$\leq 52,5$
NOTE: A loading rate of $(400 \pm 40)$ N/s should be used when testing specimens of class N 1		

### 7.2 Physical requirements

#### 7.2.1 Fineness

The fineness of a normal hardening hydraulic road binder shall be determined by sieving.

Sieving shall be carried out in accordance with EN 196-6. The sieve residue shall not exceed the value given in Table 2.

#### 7.2.2 Initial setting time

Initial setting time, determined in accordance with EN 196-3, shall conform to the requirements given in Table 2.

If the HRB contains calcium quick lime (CL-Q) as main constituent, the available lime of the HRB sample shall be slaked before testing according to the slaking procedure described in annex A.

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For the class N 1, in contrast to the procedure described in the EN 196-3, specimens shall not be stored in a water bath but under air curing conditions ( $(20 \pm 2) ^\circ\text{C}$  / 90 % rH min).

**7.2.3 Soundness**

Expansion, determined in accordance with EN 196-3, shall conform to the requirements given in Table 2.

If the HRB contains calcium quick lime (CL-Q) as a main constituent, the available lime of the HRB sample shall be slaked before testing according to the slaking procedure described in annex A.

Normal hardening hydraulic road binders containing more than 4,0 % by mass of  $\text{SO}_3$  shall, in addition, withstand the cold water test described in EN 459-2. They shall be regarded as unsound if, following storage in water, the two specimens have warping or gaping edge cracks either on their own or in conjunction with crazing.

**Table 2 : Physical requirements**

<b>Fineness % residue by mass 90 <math>\mu\text{m}</math></b>	<b>Initial setting time min</b>	<b>Soundness (expansion) mm</b>
$\leq 15$	$\geq 150$	$\leq 30$

**7.3 Chemical requirement - Sulfate content**

The sulfate content, expressed as the percentage of  $\text{SO}_3$  by mass, and determined in accordance with EN 196-2, shall not exceed 4,0 %.

A sulfate content of up to 9,0 % by mass is permitted for the following road binders, provided that they meet the requirements in 7.2.3:

normal hardening hydraulic road binders containing burnt shale (T) or calcareous fly ash (W, Wa), only when most of the sulfate comes from the main constituents;

normal hardening hydraulic road binders containing more than 60 %, by mass, of granulated blastfurnace slag (S).

A sulfate content of up to 11,5 % by mass is permitted for binders containing burnt oil shale, only when the greater part of the sulfate content comes from the burnt oil shale.

When  $\text{SO}_3$  content exceeds 4 %, the letter Cs shall be added in the declaration (see 7.4.2).

**7.4 Composition****7.4.1 Declaration of composition**

The constituents of a normal hardening hydraulic road binder, and their average proportion in the finished product, shall be recorded. The main constituents shall be declared by the manufacturer (see clause 8) (§ 5.1), as well as calcium sulfate (5.3) if the sulfate ( $\text{SO}_3$ ) content of the normal hardening hydraulic road binder exceeds 4 %.

**7.4.2 Requirements**

The composition of a normal hardening hydraulic road binder shall meet, for all main constituents taken individually, the values documented by the manufacturer and declared (see 7.4.1 and clause 8) within absolute tolerances given in Table 3.