



# SLOVENSKI STANDARD

## SIST EN 13282-2:2015

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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

Liants hydrauliques routiers - Liants hydrauliques routiers à durcissement normal – Partie 2: Composition, spécifications et critères de conformité

Ta slovenski standard je istoveten z: **EN 13282-2:2015**

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93.080.20	Materiali za gradnjo cest	Road construction materials

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EUROPEAN STANDARD

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

Liants hydrauliques routiers - Liants hydrauliques routiers à durcissement normal - Partie 2: Composition, spécifications et critères de conformité

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

This European Standard was approved by CEN on 8 February 2015.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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**EN 13282-2:2015 (E)****Foreword**

This European Standard (EN 13282-2:2015) has been prepared by Technical Committee CEN/TC 51 "Cement and building limes", the secretariat of which is held by NBN.

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 October 2015, and conflicting national standards shall be withdrawn at the latest by October 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document and EN 13282-1:2013 supersedes ENV 13282:2000.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

For relationship with Regulation (EU) No. 305/2011, see the 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.*

The Scopes of EN 13282-1 and EN 13282-2 that supersede ENV 13282:2000 are covering more families of products. They refer to the classification of building limes given in EN 459-1:2010.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## Introduction

Depending on the local experience and availability of products and materials, different binders are used for roadbases and sub-bases, capping layers, soil treatment (stabilization and improvement) in Europe. These include cements conforming to EN 197-1, building limes conforming to EN 459-1 and hydraulic road binders presently defined in existing national standards or national 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 into normal hardening hydraulic road binders, specified in this part of European Standard and rapid hardening hydraulic road binders, specified in EN 13282-1. EN 13282-3 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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**EN 13282-2:2015 (E)****1 Scope**

-This European Standard 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.

It includes the mechanical, physical and chemical requirements and the classification of these binders based on their compressive strength at 56 days. It also includes the conformity criteria and evaluation procedures to be applied by the manufacturer.

**2 Normative references**

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN 196-2, *Method of testing cement — Part 2: Chemical analysis of cement*

EN 196-3, *Methods of testing cement — Part 3: Determination of setting times 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 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

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

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

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

EN 13282-3, *Hydraulic road binders — Part 3: Conformity evaluation*

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

**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN 197-1 and the following 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

**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 CR**

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

**3.7****available lime of a normal hardening hydraulic road binder CaOab**

quantity of available CaO of a normal hardening hydraulic road binder, expressed in % by mass of the normal hardening hydraulic road binder, determined in accordance with the method for quicklime given in EN 459-2, but filtering the suspension obtained after sugar extraction, before performing titration, through two fine filter papers (mean pore diameter of approximately 2  $\mu\text{m}$ , ash content < 0,01 % by mass) placed in a Buchner funnel

Note 1 to entry: Available CaOab of a normal hardening hydraulic road binder mostly originates from the main constituent calcium lime (CL).

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**3.8****slaking water content Ws**

quantity of water needed to slake the normal hardening hydraulic road binder before testing, expressed in % by mass of unslaked binder

**4 Hydraulic road binder****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 h production.

**EN 13282-2:2015 (E)****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, sulfate content and composition as given in Clause 7.

**5 Constituents****5.1 Main constituents**

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

- a) Constituents defined as main constituents in EN 197-1:
- 1) Portland cement clinker (K);
  - 2) granulated blastfurnace slag (S);
  - 3) pozzolanic materials: natural pozzolana (P) and natural calcined pozzolana (Q);
  - 4) siliceous fly ash (V) and calcareous fly ash (W);
  - 5) burnt shale (T);
  - 6) limestone (L,LL).
- b) other fly ashes:
- 1) siliceous fly ash of circulating fluidised bed (Va) resulting from coal combustion which shall conform to the following requirements, in mass fraction percent:
    - i)  $(\text{SiO}_2) + (\text{Al}_2\text{O}_3) + (\text{Fe}_2\text{O}_3) \geq 70$  % by mass;
    - ii) free CaO  $\leq 2$  % by mass determined in accordance with EN 451-1;
    - iii) reactive silicon dioxide  $> 20$  % by mass;
    - iv)  $\text{SO}_3 \leq 6$  % by mass;
    - v) mass fraction passing 315  $\mu\text{m} = 100$  % by mass.
  - 2) unslaked calcareous fly ash (Wa) containing at least 15 % by mass reactive calcium oxide (CaO), to be used only as a constituent of normal hardening hydraulic road binders of classes N1 and N2 (see Table 1).
- 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.
- c) paper sludge ash (WP) coming from incineration of paper sludge in accordance with the following characteristics, in mass fraction percent:
- 1) total CaO  $\geq 35$  % by mass;

- 2)  $(\text{SiO}_2) + (\text{Al}_2\text{O}_3) + (\text{Fe}_2\text{O}_3) \geq 15$  % by mass;
- 3)  $\text{MgO} \leq 5$  % by mass;
- 4) free  $\text{CaO} \geq 7$  % by mass determined in accordance with EN 451-1;
- 5)  $\text{SO}_3 \leq 2,0$  % by mass.

The loss on ignition of paper sludge ash (WP), 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.

- d) crystallised basic oxygen furnace (BOF) slag (Sb) resulting from the transformation of pig iron into steel through an oxygen treatment process which shall conform to the following requirements, in mass fraction percent:
  - 1) total  $\text{CaO} \geq 35$  % by mass;
  - 2)  $(\text{SiO}_2) + (\text{Al}_2\text{O}_3) + (\text{Fe}_2\text{O}_3) \geq 35$  % by mass;
  - 3)  $\text{MgO} \leq 9$  % by mass;
  - 4) free  $\text{CaO}$  from 7 % to 15 % by mass determined in accordance with EN 451-1;
  - 5)  $\text{SO}_3 \leq 0,5$  % by mass;
  - 6) soundness  $\leq 30$  mm determined in accordance with EN 196-3 (measured on slag ground to Blaine fineness greater than 2 000  $\text{cm}^2/\text{g}$ ).
- e) calcium lime (CL) and natural hydraulic lime (NHL) which conform to EN 459-1. CL limes may be in the form of either quicklime (CL-Q) or hydrated lime (CL-S).

## 5.2 Minor additional constituents

Minor additional constituents may 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) or any mixture of them may be added to the other constituents of the normal hardening hydraulic road binder during its manufacture.

**EN 13282-2:2015 (E)****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, on a dry basis, shall not exceed 1 % by mass of the binder.

A total content of additives greater than 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 designation includes 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 Table 1: N 1, N 2, N 3 and N 4 (see 7.2).

NOTE Strength classes are incorporated to control the consistency of the production. They are not related to the mechanical performance of soils or other materials treated with normal hardening hydraulic road binders.

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**7 Requirements**

SIST EN 13282-2:2015

**7.1 General**

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If the available CaOab of a normal hardening hydraulic road binder which contains quicklime as main constituent is exceeding 10 % by mass, the binder shall be slaked before being tested for compressive strength, initial setting time or soundness.

NOTE 1 CaOab always exceeds 10 % if CL-Q declared content is not less than 23 % (CL 90-Q), 27 % (CL 80-Q) or 30 % (CL 70-Q). In these cases it is not necessary to measure CaOab in order to decide if the binder should be slaked before preparing specimens, the answer being always affirmative. For lesser declared values, it is necessary to determine CaOab in accordance with the method specified in 3.7.

NOTE 2 Values in Note 1 have been obtained combining the minimum CL-Q actual content according to the tolerances defined in 7.5.2 and the minimum single result of available lime content of the quicklime permitted for each class in EN 459-1.

EXAMPLE For a normal hardening hydraulic road binder conforming to this European Standard declared to contain 27 % by mass quicklime (CL 80-Q), the actual proportion of CL 80-Q would be between 17 and 37 % (see 7.5.2). The minimum single result for the available lime content of CL 80 Q permitted by EN 459-1 is 62 %. Consequently, even combining both minimum values, the available lime content CaOab of the binder should be at least

$$17 \times (62/100) = 10,5 \%$$

The slaking procedure used shall be documented.

When the procedure is applied by the manufacturer for assessment and verification of constancy of performance (AVCP) of a normal hardening hydraulic road binder, it should be documented in the factory production control.