

**SLOVENSKI STANDARD**  
**kSIST-TS FprCEN/TS 13286-54:2014**  
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**Nevezane in hidravlično vezane zmesi - 54. del: Preskusna metoda za določanje občutljivosti za mraz - Odpornost proti zmrzovanju in odtaljevanju hidravlično vezanih zmesi**

Unbound and hydraulically bound mixtures - Part 54: Test method for the determination of frost susceptibility - Resistance to freezing and thawing of hydraulically bound mixtures

Ungebundene und hydraulisch gebundene Gemische - Teil 54: Prüfverfahren zur Bestimmung der Frostepfindlichkeit - Frost-Tau-Wechselbeständigkeit von hydraulisch gebundenen Gemischen

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Mélanges traités et mélanges non traités aux liants hydrauliques - Partie 54: Méthode d'essai pour la détermination de la sensibilité au gel - Résistance au gel et au dégel des mélanges traités aux liants hydrauliques

**Ta slovenski standard je istoveten z: FprCEN/TS 13286-54**

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**ICS:**

93.080.20      Materiali za gradnjo cest      Road construction materials

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ICS

English Version

**Unbound and hydraulically bound mixtures - Part 54: Test method for the determination of frost susceptibility - Resistance to freezing and thawing of hydraulically bound mixtures**

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Ungebundene und hydraulisch gebundene Gemische - Teil 54: Prüfverfahren zur Bestimmung der Frostempfindlichkeit - Frost-Tau-Wechselbeständigkeit von hydraulisch gebundenen Gemischen

This draft Technical Specification is submitted to CEN members for Technical Committee Approval. It has been drawn up by the Technical Committee CEN/TC 227.

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

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## Foreword

This document (CEN/TS 13286-54:2014) has been prepared by Technical Committee CEN/TC 227 “Unbound and hydraulically bound mixtures”, the secretariat of which is held by DIN.

This document is currently submitted to the Formal Vote.

This Technical Specification is one of a series of standards as listed below:

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 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*

prEN 13286-6, *Unbound and hydraulically bound mixtures — Test methods — Part 6: Test methods for laboratory reference density and moisture content — Test methods for sampling and sample reduction*

EN 13286-7, *Unbound and hydraulically bound mixtures — Part 7: Cyclic load triaxial test for unbound mixtures*

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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*

EN 13286-44, *Unbound and hydraulically bound mixtures — Part 44: Test method for the determination of the alpha coefficient of vitrified blast furnace slag*

EN 13286-45, *Unbound and hydraulically bound mixtures — Part 45: Test method for the determination of the workability period 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*

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EN 13286-48, *Unbound and hydraulically bound mixtures — Part 48: Test method for the determination of the degree of pulverization*

EN 13286-49, *Unbound and hydraulically bound mixtures — Part 49: Accelerated swelling test of soil treated by lime and/or hydraulic binders*

EN 13286-50, *Unbound and hydraulically bound mixtures — Part 50: Methods for making test specimens using proctor equipment or vibrating table compaction*

EN 13286-51, *Unbound and hydraulically bound mixtures — Part 51: Methods for making test specimens by vibrating hammer compaction*

EN 13286-52, *Unbound and hydraulically bound mixtures — Methods for making test specimens — Part 52: Making specimens by vibro-compression*

EN 13286-53, *Unbound and hydraulically bound mixtures — Methods for making test specimens — Part 53: Making cylindrical specimens by axial compression*

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## Introduction

At present, this test method is not proposed as an European Standard (EN) but issued instead as a Technical Specification (TS). It will remain a TS until more data and experience is forthcoming regarding the most appropriate conditioning of specimens immediately prior to freeze-thaw cycling. Reference to the test method reveals that three methods of conditioning are described/permitted for the two day stage between first stage curing (to permit adequate strength development) and the freeze-thaw testing stage. This second stage conditioning can be either complete submersion in a water bath, storage in a humidity cabinet, or continuation of the first stage curing. Typically the latter consists of curing to prevent loss of moisture. As is stated in the test method, it is probable that water bath curing of the test specimens is more robust than humidity cabinet curing which in turn may be more robust than the initial first stage curing. The choice of method is deliberately left for determination at the place of use and will depend on the type and nature of the hydraulically bound mixture or hydraulically treated soil, the particular application and the known/expected climatic conditions. Users of the test method are invited/encouraged to trial the different methods of second stage curing and to provide feedback. Then and only then will consideration be given to specifying a preferred/necessary method of second stage curing and then to the issuing of the TS as a EN.

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**CEN/TS 13286-54:2014 (E)****1 Scope**

This Technical Specification specifies a test method for the determination of the resistance of a hydraulically bound mixture to the cyclic action of freezing and thawing.

The method described is suitable for hydraulically bound mixtures, including hydraulically stabilised soils, in accordance with EN 14227 (all parts) and the range of strengths covered by that standard.

When required, a method for determining the change in length of a hydraulically bound subject to freeze thaw is specified in Annex A (normative).

When required, a method for determining the freeze thaw resistance of a hydraulically bound mixture in the presence of salt is specified in Annex B (normative).

**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 932-5, *Tests for general properties of aggregates — Part 5: Common equipment and calibration*

EN 1367-1, *Tests for thermal and weathering properties of aggregates — Part 1: Determination of resistance to freezing and thawing*

EN 1367-4, *Tests for thermal and weathering properties of aggregates — Part 4: Determination of drying shrinkage*

EN 1367-6, *Test for thermal and weathering properties of aggregates — Part 6: Determination of resistance to freezing and thawing in the presence of salt (NaCl)*

EN 14227 (all parts), *Hydraulically bound mixtures — Specifications*

**3 Terms and definitions**

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

**3.1 test specimen**  
sample used in a single determination when a test method requires more than one determination of a property

**3.2 laboratory sample**  
reduced sample derived from a bulk sample for laboratory testing

**3.3 hydraulically bound mixture**  
mixture that sets and hardens by hydraulic reaction



## 4 Principle

Two sets of three test specimens are prepared from a hydraulically bound mixture. The moulds containing the mixture are then placed in initial (first stage) curing conditions specified by the nature of the hydraulic constituents and in accordance with national regulation or decision at the place of use.

On completion of the first stage curing, the two sets of test specimens (sets A and B) are removed from their moulds and placed in a water bath or humidity cabinet or returned to the initial curing conditions, for two days further curing (second stage).

NOTE 1 Water bath curing is more robust/onerous than humidity cabinet curing which in turn may be more robust/onerous than the initial curing condition employed. The selection therefore of the type of second stage curing depends on the type and nature of the hydraulically bound mixture or hydraulically stabilised soil in question, the particular application for the HBM and the climatic conditions.

On completion of second stage curing, one set of three test specimens (Set A) is removed from the second stage curing, surface dried and tightly wrapped in plastic (cling) film. The second "control" set of three test specimens (Set B) remains in the second stage curing conditions.

Set A specimens are then placed in a prepared freeze thaw cabinet and subjected to ten freeze-thaw cycles, each cycle lasting 24 h. After completion of the tenth freeze thaw cycle, the Set A specimens are unwrapped and returned to the second stage curing regime for one day at 20 °C to ensure complete thawing.

The strength of both sets of three test specimens is then measured and the mean value of strength for each set compared.

NOTE 2 An additional set of three test specimens (Set C) can be used to give additional information about the strength of the mixture after second stage curing. The use of Set C allows the gain in strength of the 'control' set (Set B) between the end of second stage curing and the time of strength testing of Set B to be evaluated.

NOTE 3 When required, the steel hemispherical buttons used to measure the length of the test specimen (Annex A) are also fitted into the inserts at the end of second stage curing.

## 5 Apparatus

**5.1 All apparatus**, unless otherwise stated, shall conform to the general requirements of EN 932-5.

**5.2 Cylindrical moulds**, for test specimen preparation, as specified in the relevant test specimen preparation Standard (see Clause 6). Six moulds are required.

NOTE The use of moulds that are capable of being split along the longitudinal axis may be used to allow removal of the test specimen with the minimum of damage.

**5.3 Watertight plastic bags (or plastic film)**, for initial curing.

**5.4 Initial curing area(s)**, capable of temperature controlled curing at the specified temperature and moisture condition.

A humidity cabinet, capable of control at the specified temperature and 90 % to 100 % relative humidity, is a permitted option.

**5.5 Water bath**, controlled at  $(20 \pm 2)$  °C, one of the permitted options for second stage curing.

A humidity cabinet controlled at  $(20 \pm 2)$  °C and 90 % to 100 % RH is a permitted alternative for second stage curing (as 5.4 above).

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**5.6 Low temperature cabinet**, complying with the requirements of EN 1367-1.

**5.7 Electronic thermocouple thermometer**, or similar device, accurate to 0.1 °C used to monitor the temperature in the centre of the cooled area in the low temperature cabinet.

The thermocouple probe shall be located in the centre of a metal can complying with EN 1367-1, containing (2 000 ± 5) g of 8/16 mm size aggregate and filled with water to a level at least 10 mm above the aggregate.

**5.8 Suitable cloths**, to surface dry the saturated test specimens.

**5.9 Plastic (cling) film**, for tightly wrapping one set of saturated test specimens before they are placed in the low temperature cabinet.

NOTE 1 See Annex A for additional requirements for the base of moulds fitted with inserts for measuring height.

NOTE 2 Suitable apparatus will also be required for test specimen preparation and strength testing, as specified in the relevant European Standards.

NOTE 3 Low temperature cabinets that control the temperature of the thawing stage using air circulation are preferred for this test method.

NOTE 4 Three more moulds are required if a third set of test specimens (Set C) is tested at the end of second stage curing.

## 6 Test specimens

### 6.1 Preparation

On day one, make six cylindrical test specimens from a laboratory sample of the hydraulically bound mixture to be tested. Prepare the test specimens in cylindrical moulds using one of the methods from Table 1.

NOTE 1 When required, an additional set of three test specimens (Set C) may be used to give additional information about the strength of the mixture at the end of second stage curing.

NOTE 2 It is important that all test specimens are the same nominal size and are prepared using the same compaction method.