Unbound and hydraulically bound mixtures
Part 54: Test method for the determination of frost susceptibility — Resistance to freezing and thawing of hydraulically bound mixtures
This Published Document is the UK implementation of CEN/TS 13286-54:2014.

The UK participation in its preparation was entrusted to Technical Committee B/510/4, Cementitious bound materials, unbound granular materials, waste materials and marginal materials.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2014. Published by BSI Standards Limited 2014

ISBN 978 0 580 85552 8

ICS 93.080.20

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 November 2014.

Amendments issued since publication

Date Text affected
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>3</td>
</tr>
<tr>
<td>Introduction</td>
<td>5</td>
</tr>
<tr>
<td>1 Scope</td>
<td>6</td>
</tr>
<tr>
<td>2 Normative references</td>
<td>6</td>
</tr>
<tr>
<td>3 Terms and definitions</td>
<td>6</td>
</tr>
<tr>
<td>4 Principle</td>
<td>7</td>
</tr>
<tr>
<td>5 Apparatus</td>
<td>7</td>
</tr>
<tr>
<td>6 Test specimens</td>
<td>8</td>
</tr>
<tr>
<td>6.1 Preparation</td>
<td>8</td>
</tr>
<tr>
<td>6.2 Initial (first stage) curing of test specimens</td>
<td>9</td>
</tr>
<tr>
<td>6.3 Removal from moulds at the end of first stage curing</td>
<td>9</td>
</tr>
<tr>
<td>7 Test procedure</td>
<td>10</td>
</tr>
<tr>
<td>7.1 Second stage curing</td>
<td>10</td>
</tr>
<tr>
<td>7.2 Set A — Exposure to freezing after 2 days of second stage curing</td>
<td>10</td>
</tr>
<tr>
<td>7.3 Set A — final thawing and conditioning for 24 h prior to strength testing</td>
<td>11</td>
</tr>
<tr>
<td>7.4 Strength testing after final thawing and conditioning</td>
<td>11</td>
</tr>
<tr>
<td>8 Calculation</td>
<td>12</td>
</tr>
<tr>
<td>9 Test report</td>
<td>12</td>
</tr>
<tr>
<td>Annex A (normative) Change in height</td>
<td>13</td>
</tr>
<tr>
<td>Annex B (normative) Freeze thaw in the presence of salt</td>
<td>15</td>
</tr>
<tr>
<td>Bibliography</td>
<td>16</td>
</tr>
</tbody>
</table>
Foreword

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

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 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

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

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

EN 13286-48, Unbound and hydraulically bound mixtures — Part 48: Test method for the determination of the degree of pulverization
According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: 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

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.
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 14227-1 to EN 14227-5 and the range of strengths covered by that standard.

When required, a method for determining the change in height 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, Tests 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