

**Unbound and hydraulically bound mixtures - Part 4: Test method for the determination of the laboratory reference density and water content - Vibrating hammer**

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Test method for the determination of the laboratory  
reference density and water content - Vibrating  
hammer

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 13286-4:2003 sisaldab Euroopa standardi EN 13286-4:2003 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 15.04.2003 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 13286-4:2003 consists of the English text of the European standard EN 13286-4:2003.</p> <p>This document is endorsed on 15.04.2003 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p><b>Käsitlusala:</b> This European Standard describes a method for the determination of the relationship between the dry density and water content of a mixture when compacted using a vibrating hammer</p>	<p><b>Scope:</b> This European Standard describes a method for the determination of the relationship between the dry density and water content of a mixture when compacted using a vibrating hammer</p>
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**ICS** 93.080.20

**Võtmesõnad:** density (mass/volume), density (number/volume), paveme, pavements, road construction, roads, rocks, size ranges, specification (approval), specifications, specimen preparation, testing, testing conditions, unbound, water, water content, vibrated density, vibration

English version

**Unbound and hydraulically bound mixtures - Part 4: Test  
methods for laboratory reference density and water content -  
Vibrating hammer**

Mélanges traités et mélanges non traités aux liants  
hydrauliques - Partie 4: Méthodes d'essai pour la masse  
volumique de référence et la teneur en eau en laboratoire -  
Marteau vibrant

Ungebundene und hydraulisch gebundene Gemische - Teil  
4: Laborprüfverfahren für die Trockendichte und den  
Wassergehalt - Vibrationshammer

This European Standard was approved by CEN on 12 December 2002.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and United Kingdom.



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## Foreword

This document (EN 13286-4:2003) 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 September 2003, and conflicting national standards shall be withdrawn at the latest by December 2003.

This European Standard is one of a series of standards as follows:

EN 13286-1, *Unbound and hydraulically bound mixtures – Part 1: Test methods for laboratory reference density and water content – Introduction, general requirements and sampling.*

prEN 13286-2, *Unbound and hydraulically bound mixtures – Part 2: Test methods for 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 13286-7, *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.*

prEN 13286-44, *Unbound and hydraulically bound mixtures – Part 44: Test method for the determination of the alpha coefficient of vitrified blastfurnace slag.*

prEN 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.*

prEN 13286-47, *Unbound and hydraulically bound mixtures – Part 47: Test method for the determination of California bearing ratio, immediate bearing index and linear swelling.*

prEN 13286-48, *Unbound and hydraulically bound mixtures – Part 48: Test method for the determination of the degree of pulverisation.*

prEN 13286-49, *Unbound and hydraulically bound mixtures — Part 49: Test method for the determination of the accelerated swelling of soil treated by lime and/or hydraulic binder.*

prEN 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.*

prEN 13286-51, *Unbound and hydraulically bound mixtures — Part 51: Method for the manufacture of test specimens of hydraulically bound mixtures using vibrating hammer compaction.*

prEN 13286-52, *Unbound and hydraulically bound mixtures — Part 52: Method for the manufacture of test specimens of hydraulically bound mixtures using vibrocompression.*

prEN 13286-53, *Unbound and hydraulically bound mixtures — Part 53: Method for the manufacture of test specimens of hydraulically bound mixtures using axial compression.*

Annexes A and B are normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and the United Kingdom.

## 1 Scope

This European Standard specifies a method for the determination of the relationship between the dry density and water content of a mixture when compacted using a vibrating hammer.

This European Standard applies to mixtures used in road construction which contain not more than 30 % by mass retained on the 20 mm test sieve. It is not applicable to mixtures with more than 10 % by mass of the mixture retained on the 40 mm test sieve.

## 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 (including amendments).

EN 932-2, *Tests for general properties of aggregates – Part 2: Methods for reducing laboratory samples.*

EN 933-1, *Tests for geometrical properties of aggregates – Part 1: Determination of particle size distribution – Sieving method.*

EN 1097-5, *Tests for mechanical and physical properties of aggregates – Part 5: Determination of the water content by drying in a ventilated oven.*

EN 13286-1:2003, *Unbound and hydraulically bound mixtures – Part 1: Test methods for laboratory reference density and water content – Introduction, general requirements and sampling.*

## 3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 13286-1:2003 apply.

## 4 Principle

The mixture is compacted into a CBR-type cylindrical metal mould using an electrically powered vibrating hammer over a range of water contents. The range includes the optimum water content at which the maximum dry density for the specified degree of compaction is obtained. The relationship between dry density and water content is described in EN 13286-1.

## 5 Apparatus

**5.1 Cylindrical, corrosion resistant, metal mould**, with an internal diameter of  $(152,0 \pm 0,5)$  mm, an internal depth  $(127,0 \pm 1,0)$  mm and a minimum wall thickness of 5,0 mm. The internal faces shall be smooth, clean and dry before use.

NOTE Cylindrical mould and collar extension is shown in Figure 1.

**5.2 Detachable baseplate and removable extension piece**, to fit mould.

**5.3 Electrically powered vibrating hammer**, conforming to the performance check in annex A.

NOTE A vibrating hammer with a power consumption of at least 600 W, an operating frequency between 25 Hz and 60 Hz, and fitted with a suitable safety circuit breaker may be suitable.