

Unbound and hydraulically bound mixtures —

Part 51: Method for the manufacture of
test specimens of hydraulically bound
mixtures using vibrating hammer
compaction

The European Standard EN 13286-51:2004 has the status of a
British Standard

ICS 93.080.20

National foreword

This British Standard is the official English language version of EN 13286-51:2004.

The UK participation in its preparation was entrusted by Technical Committee B/510, Road materials, to Subcommittee B/510/4, Cementitious bound materials, unbound granular materials, waste materials and marginal materials, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the BSI Electronic Catalogue or of British Standards Online.

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

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 8, an inside back cover and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 21 January 2005

© BSI 21 January 2005

ISBN 0 580 45301 4

English version

Unbound and hydraulically bound mixtures - Part 51: Method for
the manufacture of test specimens of hydraulically bound
mixtures using vibrating hammer compaction

Mélanges traités et mélanges non traités aux liants
hydrauliques - Partie 51: Méthode de confection par
compactage au marteau vibrant des éprouvettes de
matériaux traités aux liants hydrauliques

Ungebundene und hydraulisch gebundene Gemische - Teil
51: Verfahren zur Herstellung von Probekörpern von
hydraulisch gebundenen Gemischen durch Verdichtung mit
Vibrationshammer

This European Standard was approved by CEN on 12 November 2004.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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



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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

	Page
Foreword.....	3
1 Scope	5
2 Normative references.....	5
3 Terms and definitions	5
4 Principle.....	5
5 Dimensions of the specimens.....	5
6 Apparatus	6
7 Procedure	6
8 Storage.....	7
9 Test report	7

Foreword

This document (EN 13286-51:2004) 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 June 2005, and conflicting national standards shall be withdrawn at the latest by June 2005.

This document is one of a series of documents as listed below.

EN 13286-1, <i>Unbound and hydraulically bound mixtures density and water content</i>	<i>Part 1: Test methods for laboratory reference density and water content</i> <i>Introduction, general requirements and sampling</i>
EN 13286-2, <i>Unbound and hydraulically bound mixtures density and water content</i>	<i>Part 2: Test methods for the determination of the laboratory reference density and water content</i> <i>Proctor compaction</i>
EN 13286-3, <i>Unbound and hydraulically bound mixtures density and water content</i>	<i>Part 3: Test methods for laboratory reference density and water content</i> <i>Vibrocompression with controlled parameters</i>
EN 13286-4, <i>Unbound and hydraulically bound mixtures density and water content</i>	<i>Part 4: Test methods for laboratory reference density and water content</i> <i>Vibrating hammer</i>
EN 13286-5, <i>Unbound and hydraulically bound mixtures density and water content</i>	<i>Part 5: Test methods for laboratory reference density and water content</i> <i>Vibrating table</i>
EN 13286-7, <i>Unbound and hydraulically bound mixtures</i>	<i>Part 7: Cyclic load triaxial test for unbound mixtures</i>
EN 13286-40, <i>Unbound and hydraulically bound mixtures direct tensile strength of hydraulically bound mixtures</i>	<i>Part 40: Test method for the determination of the direct tensile strength of hydraulically bound mixtures</i>
EN 13286-41, <i>Unbound and hydraulically bound mixtures compressive strength of hydraulically bound mixtures</i>	<i>Part 41: Test method for the determination of the compressive strength of hydraulically bound mixtures</i>
EN 13286-42, <i>Unbound and hydraulically bound mixtures indirect tensile strength of hydraulically bound mixtures</i>	<i>Part 42: Test method for the determination of the indirect tensile strength of hydraulically bound mixtures</i>
EN 13286-43, <i>Unbound and hydraulically bound mixtures modulus of elasticity of hydraulically bound mixtures</i>	<i>Part 43: Test method for the determination of the modulus of elasticity of hydraulically bound mixtures</i>
EN 13286-44, <i>Unbound and hydraulically bound mixtures alpha coefficient of vitrified blast furnace slag</i>	<i>Part 44: Test method for the determination of the alpha coefficient of vitrified blast furnace slag</i>
EN 13286-45, <i>Unbound and hydraulically bound mixtures workability period of hydraulically bound mixtures</i>	<i>Part 45: Test method for the determination of the workability period of hydraulically bound mixtures</i>
EN 13286-46, <i>Unbound and hydraulically bound mixtures moisture condition value</i>	<i>Part 46: Test method for the determination of the moisture condition value</i>
EN 13286-47, <i>Unbound and hydraulically bound mixtures California bearing ratio, immediate bearing index and linear swelling</i>	<i>Part 47: Test method for the determination of California bearing ratio, immediate bearing index and linear swelling</i>

EN 13286-51:2004 (E)

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

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

EN 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*

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

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

EN 13286-53, *Unbound and hydraulically bound mixtures* *Part 53: Methods for the manufacture of test specimens of hydraulically bound mixtures using axial compression*

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

1 Scope

This document specifies test methods for making cylindrical or cubical specimens of hydraulically bound mixtures compacted to refusal density using a vibrating hammer. This document applies to mixtures, or that part of a mixture, containing aggregate up to a maximum size of 31,5 mm.

2 Normative references

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

EN 933-2, *Tests for geometrical properties of aggregates — Part 2: Determination of particle size distribution — Test sieves, nominal size of apertures*

EN 12390-1, *Testing hardened concrete — Part 1: Shape, dimensions and other requirements for specimens and moulds*

EN 13286-4:2003, *Unbound and hydraulically bound mixtures — Part 4: Test method for laboratory reference density and water content* *Vibrating hammer*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13286-4:2003 and the following apply.

3.1

vibrating hammer compaction to refusal

method of manufacture of a laboratory test specimen by compacting in layers an undefined quantity of mixture into a mould of known volume using a vibrating hammer and tamper until no further compaction is possible (refusal)

4 Principle

Cylindrical or cubical specimens of the mixture are made by vibrating hammer compaction to refusal. After compaction, the specimens are stored at a specified temperature and for a specified period of time minimizing loss of moisture until required for testing.

5 Dimensions of the specimens

Specimens shall conform to the dimensions given in Table 1.

Table 1 — Nominal specimen dimensions for cubes and cylinders

Column	1	2	3
Line	Specimen diameter or cube dimension, d mm	Specimen height, h mm	Maximum size of particle permitted in the specimen mm
1	100	100	22,4
2	150	150	31,5

6 Apparatus

6.1 Cylindrical specimens

6.1.1 Moulds, whose dimensions conform to the specimen requirements in Table 1. The moulds shall be strong enough to prevent distortion during compaction and shall be capable of being held rigidly in place with their base-plates during compaction.

NOTE Either metal, split or plastic moulds can be employed. Plastic moulds have been found to be particularly convenient for slow setting mixtures since the specimen can be left in the mould until the time of test. Reusable or disposable plastic moulds are also suitable for mixtures that need to be contained during storage that would otherwise disintegrate on extrusion from the mould immediately after compaction. Plastic moulds are also more suitable for mixtures that are corrosive to metal.

6.1.2 Vibrating hammer, electric or pneumatic, conforming to EN 13286-4.

6.1.3 Steel circular tampers, with nominal diameters of 0,6 d and 0,95 d.

6.2 Cubical specimens

6.2.1 Moulds, whose dimensions conform to the specimen requirements in Table 1 and which conform to EN 12390-1.

6.2.2 Vibrating hammer, electric or pneumatic, conforming to EN 13286-4.

6.2.3 Steel square tampers, with nominal dimensions 0,6 d and 0,95 d.

6.3 Sieves

22,4 mm and 31,5 mm test sieves conforming to EN 933-2.

6.4 Straight edge

Steel straight edge with length equal to or greater than twice the maximum internal mould diameter or width as applicable.

7 Procedure

7.1 Sieve the mixture on the 22,4 mm sieve for 100 mm specimens or on the 31,5 mm sieve for 150 mm specimens and use only the fraction passing the appropriate sieve for the manufacture of the specimens.

7.2 In the case of specimens that will not be extruded from the mould immediately after compaction, determine the mass of the mould to the nearest 5 g.

7.3 Using the tamper with dimension 0,6 d fitted to the vibrating hammer, compact the mixture into the mould in approximately 50 mm layers until it is deemed that no further compaction is possible (1 min per layer is usually sufficient). Before the next layer is added, scarify the previously compacted layer.

7.4 On completion of compaction of the final layer, strike off excess mixture with a straight edge and fill any depressions with fine mixture from the sample using a combination of the vibrating hammer fitted with the tamper of dimension 0,95 d and trowel.

NOTE In order to produce a specimen with sound parallel top and bottom faces, it may be necessary to cap the specimen. It may be convenient to carry this out at this stage.

7.5 For cylindrical specimens, proceed as follows or as in 7.6. Carefully extract or extrude the specimen from the mould. With extrusion, the speed of this operation shall not exceed 2 mm/s. Determine immediately the mass of the specimen to the nearest 5 g and then store as in Clause 8.

7.6 For cylindrical specimens that are to be kept in their moulds during storage, determine immediately the mass of the specimen and mould to the nearest 5 g and by difference, the mass of the specimen. Then store as in Clause 8.

7.7 For cubical specimens, determine immediately the mass of the specimen and mould to the nearest 5 g and by difference, the mass of the specimen. Cover the specimen to prevent moisture loss and maintain at a temperature within ± 5 °C of the specified temperature until demoulding takes place. Then store as in Clause 8.

7.8 Using the nominal dimensions of the mould and the mass of the specimen, determine the wet density of the specimen.

8 Storage

Specimens shall be stored

vertically,

preventing loss of moisture,

at a temperature within ± 2 °C of the specified temperature,

for the time specified in the relevant mixture document.

In the case of specimens stored in their moulds, carefully extrude the specimen just prior to testing. The speed of this operation shall not exceed 2 mm/s.

9 Test report

The test report shall include the following information:

- a) reference to this document;
- b) type of mixture;
- c) origin of the mixture;

- d) any preparation of the mixture where applicable;
- e) percentage by mass of mixture retained on the sieve if any;
- f) mass and nominal wet density of the specimen immediately after compaction;
- g) storage conditions of the specimen;
- h) any deviations from this document as well as any incidents that could have an effect on the result.

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at <http://www.bsi-global.com>.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at <http://www.bsi-global.com/bsonline>.

Further information about BSI is available on the BSI website at <http://www.bsi-global.com>.

Copyright

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

Details and advice can be obtained from the Copyright & Licensing Manager. Tel: +44 (0)20 8996 7070. Fax: +44 (0)20 8996 7553. Email: copyright@bsi-global.com.