
Unbound and hydraulically bound mixtures —

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

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National foreword

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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:

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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.

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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.

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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of an identical text or by endorsement, at the latest by June 2005, and conflicting national standards shall be withdrawn at the latest by June 2005.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.

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| EN 13286-1, <i>Unbound and hydraulically bound mixtures density and water content</i> | <i>Part 1: Test methods for laboratory reference
Introduction, general requirements and sampling</i> |
| EN 13286-2, <i>Unbound and hydraulically bound mixtures laboratory reference density and water content</i> | <i>Part 2: Test methods for the determination of the
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
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
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
Vibrating table</i> |
| EN 13286-7, <i>Unbound and hydraulically bound mixtures mixtures</i> | <i>Part 7: Cyclic load triaxial test for unbound</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</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</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</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</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</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</i> |
| EN 13286-46, <i>Unbound and hydraulically bound mixtures moisture condition value</i> | <i>Part 46: Test method for the determination of the</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</i> |

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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*

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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;

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- 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.

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