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Nevezane in hidravlično vezane zmesi - 47. del: Preskusna metoda za ugotavljanje kalifornijskega indeksa nosilnosti (CBR), neposrednega indeksa nosilnosti (IBI) in linearnega nabrekanja

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

Ungebundene und hydraulisch gebundene Gemische - Teil 47: Prüfverfahren zur Bestimmung des CBR-Wertes (California bearing ratio), des direkten Tragindex (IBI) und des linearen Schwellwertes

Mélanges traités et mélanges non traités aux liants hydrauliques - Partie 47: Méthode d'essai pour la détermination de l'indice portant Californien (CBR), de l'indice de portance immédiate (IPI) et du gonflement linéaire

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

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 13286-47:2020) has been prepared by Technical Committee CEN/TC 227 “Road materials”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 13286-47:2012.

In comparison with the previous edition, the following technical modifications have been made:

— editorial changes;

— a revised Clause 10 that provides more information for the possible force-penetration curves and where necessary their correction;

— a revised Annex A reflecting the revised Clause 10. The Annex A is normative.

This document 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 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 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 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*;

— CEN/TS 13286-54, *Unbound and hydraulically bound mixtures — Part 54: Test method for the determination of frost susceptibility — Resistance to freezing and thawing of hydraulically bound mixtures*.

1 Scope

This document specifies the test methods for the laboratory determination of the California bearing ratio and immediate bearing index.

The tests are appropriate to that part of the mixture up to a maximum particle size of 22,4 mm.

When immersion in water is specified as part of the curing of the specimen, this document also includes the determination of vertical swelling of the specimen before the determination of the California bearing ratio.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1097-5, *Tests for mechanical and physical properties of aggregates - Part 5: Determination of the water content by drying in a ventilated oven*

EN 13286-2, *Unbound and hydraulically bound mixtures - Part 2: Test methods for laboratory reference density and water content - Proctor compaction*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
California bearing ratio
ratio used to characterise the bearing capacity of a mixture, determined immediately after compaction, or after a period of curing

3.2
immediate bearing index
immediate California bearing ratio test without surcharge

3.3
Proctor compactive effort
compactive effort used in the Proctor test described in EN 13286-2

3.4
modified Proctor compactive effort
compactive effort used in the modified Proctor test described in EN 13286-2

3.5
curing
period of time and storage condition between manufacture and testing of the specimen for the California bearing ratio

4 Principle

The relationship between force and penetration is determined when a cylindrical piston of a standard cross-sectional area is made to penetrate a specimen of a mixture, contained within a mould, at a given rate.

The California bearing ratio or immediate bearing index is calculated by expressing the force on the piston for a given penetration as a percentage of a reference force.

5 Apparatus

5.1 Apparatus for specimen manufacture

5.1.1 Proctor mould B with appropriate spacer disc, if required conforming to EN 13286-2.

5.1.2 Rammer A or B, conforming to EN 13286-2.

5.1.3 Balance accurate to ± 0,1 % of mass weighed and capable of weighing up to 30 kg.

5.1.4 Apparatus conforming to EN 1097-5:2008 for water content determination.

5.1.5 Miscellaneous apparatus including coarse filter papers, a steel straightedge, scrapers, etc.

5.2 Additional apparatus for soaking procedure and measurement of swelling

5.2.1 Base plate uniformly perforated for minimum 1 % of its surface.

5.2.2 Perforated top plate in aluminium alloy with adjustable stem to provide the seating for the stem of a dial gauge.

5.2.3 Unperforated top plate in aluminium alloy with a thickness (10 ± 1) mm with adjustable stem to provide the seating for the stem of a dial gauge.

5.2.4 Device for measuring the vertical expansion of the specimen for the California bearing ratio accurate to 0,05 mm.

5.2.5 Soaking tank, large enough to allow the Proctor mould B to be submerged, preferably supported on an open mesh platform.

5.2.6 Annular surcharge rings, each having a mass known to ± 100 g, an internal diameter of (53 ± 1) mm and an external diameter equal to the diameter of the mould minus 5 mm.

Alternatively half-annular segments may be used.

5.3 Additional apparatus for determination of the California bearing ratio and immediate bearing index

5.3.1 Cylindrical penetration piston with a diameter of (50 ± 0,5) mm, the lower end of which shall be of hardened steel.

5.3.2 Loading machine with a capacity of at least 50 kN capable of applying the test force through the piston at a penetration rate of (1,27 ± 0,20) mm/min.

The machine shall be equipped with a load-indicating device that can be read to 5 N or less.

6 Test sample for the California bearing ratio and immediate bearing index tests

After sieving on a 22,4 mm sieve, approximately 7,5 kg of mixture shall be used for one test and water content determination. The quantity shall be weighed accurately so that the actual quantity used for the test sample can be determined after compaction by difference for checking purposes.

NOTE It is possible that preliminary trials are necessary to ascertain the required quantity more closely.

The determination of the immediate bearing index shall be carried out no later than 90 min after mixing for all hydraulically bound mixtures but no sooner than 60 min where lime is used.

7 Specimen manufacture for the California bearing ratio and immediate bearing index tests

7.1 Clamp the mould, with extension collar attached, to the base plate. Insert the spacer disc over the base plate and place an anti-sticking medium such as coarse filter paper on top of the spacer disc. The California bearing ratio assembly shall be placed on a solid substrate e.g. concrete or plinth, prior to specimen manufacture. Compact the mixture into the mould using either Proctor or modified Proctor compactive effort in accordance with EN 13286-2.

NOTE It is normal but not universal practice to use a mould that requires the use of a spacer disc.

7.2 After compaction, remove the extension collar and carefully trim the mixture flush with the top of the mould with the scraper, checking with the steel straightedge. Patch with smaller size material any holes that may have developed in the surface during trimming.

7.3 Remove the baseplate and spacer disc (where used), weigh, and record the mass of the mould and mixture to the nearest 5 g.

NOTE In the case of mixtures lacking cohesion, it would be better to weigh the mould and mixture with the baseplate and spacer disc attached to avoid loss of mixture.

7.4 For immediate California bearing ratio and immediate bearing index tests, proceed to Clause 9, if not, the specimen shall be cured using one of the procedures described in Clause 8.

7.5 The material surplus to that required for the test specimen shall be used to determine, in accordance with EN 1097-5, the water content of the test portion.

8 Curing for California bearing ratio test

8.1 General

A curing period, which may be required between specimen manufacture and testing, shall consist of the storage of the specimens for a specified period of time in one of the following states:

a) a condition that prevents evaporation resulting in a loss of mass of more than 2 %;

b) a condition that permits full soaking of the specimens (immersion);

c) ‘prevention of evaporation’ [as in a)] followed by full soaking.

In each case, the type of curing, the average temperature and duration of storage shall be recorded and stated.

8.2 Curing by prevention of evaporation

Curing by prevention of water loss by evaporation shall be carried out by one of the following methods:

a) storage in a climatic cabinet or room with a relative humidity of at least 98 %;

b) coating the ends of the specimen with wax;

c) placing the end caps on the mould and sealing them with petroleum jelly, silicon or tape;

d) or other appropriate methods.

Specimens shall be stored at (20 ± 2) °C or other specified temperature.

8.3 Curing that permits full soaking

8.3.1 Place a disc of coarse filter paper on the perforated baseplate, invert the mould containing the compacted specimen, and clamp the baseplate to the mould so that the specimen is in contact with the filter paper.

NOTE 1 The top of the specimen is now at the underside in contact with the filter paper.

NOTE 2 Where the specimen has been made in a mould that does not require a spacer disc, the collar is screwed to what is now the top of the mould and the joint sealed.

8.3.2 Place a filter paper on top of the specimen followed by the perforated top plate and the fitting of the requisite number of annular surcharge discs around the stem on the perforated plate. The use of surcharge will depend on circumstances and shall be specified accordingly.

NOTE A surcharge disc of mass 2 kg simulates the effect of 70 mm of superimposed construction.

8.3.3 Place the California bearing ratio assembly and specimen in an immersion tank filled with water, at a temperature of (20 ± 2) °C, to a level that allows free access of water to the top and bottom of the specimen.

8.3.4 Mount and secure the device for measuring vertical expansion of the specimen on the mould.

8.3.5 Take initial readings for swell and allow the specimen to soak for a minimum of 96 h. Maintain a constant water level during this period.

8.3.6 If required, measure expansion to 0,05 mm at suitable intervals of time depending on the rate of vertical swell and plot a graph of expansion against elapsed time or square-root of time.

NOTE Flattening of the curve indicates when swelling is substantially complete.

8.3.7 At the end of the soaking period, take final measurements and calculate the final swell as a percentage of the initial height of the specimen.

8.3.8 On completion of soaking, remove the expansion measuring device from the California bearing ratio assembly and specimen, remove the California bearing ratio assembly and specimen from the tank, and allow the specimen to drain for (15 ± 1) min.

8.3.9 Remove the surcharge discs (if used) and perforated top plate and baseplate, weigh, and record the mass of the mould and specimen.

NOTE See Note to 7.3.