SLOVENSKI STANDARD
oSIST prEN 14944-4:2015

01-september-2015

Vpliv cementnih proizvodov na pitno vodo - Preskusne metode - 4. del: Prehod snovi iz cementnih materialov, uporabljenih na terenu, in pripadajočih necementnih proizvodov/materialov

Influence of cementitious products on water intended for human consumption - Test methods - Part 4: Migration of substances from site-applied cementititous materials and associated non-cementitious products/materials

Einfluss zementgebundener Produkte auf Wasser für den menschlichen Gebrauch - Prüfverfahren - Teil 4: Migration von Substanzen aus bauseits angewendeten zementgebundenen Materialien und zugehörigen nicht zementgebundenen Produkten/Materialien

Influence des produits à base de ciment sur l'eau destinée à la consommation humaine - Méthodes d'essai - Partie 4 : Migration de substances à partir de matériaux à base de ciment appliqués sur site et de produits/matériaux associés exempts de ciment

Ta slovenski standard je istoveten z: **prEN 14944-4**

ICS:

13.060.20	Pitna voda	Drinking water
67.250	Materiali in predmeti v stiku z živili	Materials and articles in contact with foodstuffs
91.100.10	Cement. Mavec. Apno. Malta	Cement. Gypsum. Lime. Mortar

oSIST prEN 14944-4:2015 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 14944-4

July 2015

ICS 13.060.20; 67.250

English Version

Influence of cementitious products on water intended for human consumption - Test methods - Part 4: Migration of substances from site-applied cementititous materials and associated non-cementitious products/materials

Influence des produits à base de ciment sur l'eau destinées à la consommation humaine - Méthodes d'essais - Partie 4 : Migration des substances issues de matériaux cimentaires et de produits/matériaux non cimentaires associés appliqués sur site

Einfluss zementgebundener Produkte auf Wasser für den menschlichen Gebrauch - Prüfmethoden - Teil 4 : Migration von Substanzen aus bauseits angewendeten zementgebundenen Materialien und zugehörige nicht zementgebundene Produkte/Materialien

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 164.

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

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Foreword

This document (prEN 14944-4:2015) has been prepared by Technical Committee CEN/TC 164 "Water supply", the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document describes a test method to produce migration waters for the assessment of inorganic and organic substances.

This European Standard will result in one of a series of standards that support appropriate standards.

This European Standard consists of a series dealing with the influence of cementitious and associated non-cementitious products/materials on water intended for human consumption, including:

— *Part 1: Influence of migration from factory made cementitious products on the organoleptic parameters*

— *Part 2: Influence of migration from site-applied cementitious products and associated non-cementitious products on the organoleptic parameters*

— *Part 3: Migration of substances from factory made cementitious products*

— *Part 4: Migration of substances from site-applied cementitious materials and associated non-cementitious products/materials*

This document consists of 12 clauses and the following annexes:

Annex A, which is normative, describes the testing and assessment of migration of substances from the constituents of concretes.

Annex B, which is normative, describes the testing and assessment of migration of substances from the constituents of mortars.

Annex C, which is normative, describes the testing and assessment of migration of substances from associated non-cementitious products or materials.

Annex D, which is informative, provides examples of test pieces and test conditions as a function of S/V ratio.

Annex E, which is informative, provides a schematic description of the test (preconditioning and migration) procedure.

Annex F, which is informative, gives recommendations for procedural tests using standard additions (positive control).

Introduction

With respect to any potential adverse effects of products and materials on the quality of water intended for human consumption, it should be understood that relevant national regulations remain in force until verifiable European acceptance criteria have been adopted.

1 Scope

This European Standard specifies a method to determine the potential migration of substances from hardened cementitious site-applied or site-formed materials (including pre-packaged mortars) into test waters. It also covers determination of migration from individual constituents of cementitious products and materials and from associated non-cementitious products for approval purposes (see Annex C).

Site-applied or site-formed cementitious materials which cannot be cast as cubes or prisms, e.g. some spray applied systems, should be tested as factory made cementitious products according to prEN 14944-3.

This European Standard is applicable to site-applied or site-formed cementitious materials intended to be used for the transport and storage of water intended for human consumption, including raw water used for the production of drinking water. It is also applicable to individual constituents of cementitious products and materials and to associated non cementitious products and materials.

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 196-1:2005, *Methods of testing cement - Part 1: Determination of strength*

EN 197-1, *Cement - Part 1: Composition, specifications and conformity criteria for common cements*

EN 206:2013, *Concrete - Specification, performance, production and conformity*

EN 450-1, *Fly ash for concrete - Part 1: Definition, specifications and conformity criteria*

EN 480-1, *Admixtures for concrete, mortar and grout - Test methods - Part 1: Reference concrete and reference mortar for testing*

EN 12350-2, *Testing fresh concrete - Part 2: Slump-test*

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

EN 12620, *Aggregates for concrete*

EN 12878, *Pigments for the colouring of building materials based on cement and/or lime - Specifications and methods of test*

prEN 13055, *Lightweight aggregates for concrete, mortar, grout, bituminous mixtures, surface treatments and for unbound and bound applications*

EN 13263-1, *Silica fume for concrete - Part 1: Definitions, requirements and conformity criteria*

EN 13639, *Determination of total organic carbon in limestone*

prEN 14944-3:2015, *Influence of cementitious products on water intended for human consumption - Test methods - Part 3: Migration of substances from factory-made cementitious products*

EN 15167-1, *Ground granulated blast furnace slag for use in concrete, mortar and grout - Part 1: Definitions, specifications and conformity criteria*

EN ISO 3696, *Water for analytical laboratory use - Specification and test methods (ISO 3696)*

EN ISO 7393-1, *Water quality - Determination of free chlorine and total chlorine - Part 1: Titrimetric method using N, N-diethyl-1,4-phenylenediamine (ISO 7393-1)*

EN ISO 7393-2, *Water quality - Determination of free chlorine and total chlorine - Part 2: Colorimetric method using N, N-diethyl-1, 4-phenylenediamine, for routine control purposes (ISO 7393-2)*

EN ISO 10523, *Water quality - Determination of pH (ISO 10523)*

3 Terms and definitions

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

3.1
cementitious product
factory made product containing a cementitious material supplied in the hardened state with a formed surface prior to its incorporation into the construction works

3.2
cementitious material
material that contains a hydraulic cement in sufficient proportion to act as the main binder by forming a hydrate structure which governs the performance of the material

3.3
associated non-cementitious product
product which is applied to the surface of a cementitious product, directly or indirectly, during manufacture (or construction) and which either provides a porous seal to the product or which remains as a residue in contact with water, e.g. porous seal coats, formwork release agents and curing compounds

3.4
porous seal coat
polymeric (usually organic) materials applied in a thin (25 µm to 200 µm) thickness surface layer to a cement mortar lining in order to restrict (but not prevent) interactions between the mortar and conveyed water

Note 1 to entry: See ISO 16132.

3.5
test
technical operation that consists of the determination of one or more characteristics of a given product

3.6
test procedure
specified technical method for performing a test

3.7
sample
one or more units, or a specified quantity, drawn from a batch or lot, selected at random for inspection, e.g. at the factory or in a laboratory

3.8
test piece
hardened concrete or mortar sample or portion which is to be conditioned, treated or otherwise prepared to be tested to obtain a single test result

3.9
preconditioning
succession of contact periods of a test piece with the preconditioning water (3.14) before contact with the test water

3.10
preconditioning water
water used for preconditioning prepared as described in 5.3.1

3.11
test water
water used for testing purposes prepared as described in 5.3.2 and used in accordance with 5.3.3 and 5.3.4

3.12
migration water
test water which has been in contact with a test piece under specified conditions

3.13
blank water
test water which has been kept at the same specified conditions as migration water but without contact with the test piece

3.14
tap water
drinking water distributed by a public supplier

3.15
demineralized water
water conforming to the requirements in EN ISO 3696 for Grade 3

3.16
Type I addition
nearly inert additions; general suitability as type I addition is established for:

— filler aggregate conforming to EN 12620 or prEN 13055

— pigments conforming to EN 12878

Note 1 to entry: See EN 206.

3.17
Type II addition
pozzolanic or latent hydraulic additions; general suitability as type II additions is established for:

— fly ash conforming to EN 450-1

— silica fume conforming to EN 13263-1

— ground granulated blast-furnace slag conforming to EN 15167-1

Note 1 to entry: See EN 206.

4 Principle

The procedure specifies the method for producing test pieces (normally in the form of cubes or prisms) from the site applied or site formed material under test. It also specifies the method of producing concrete or mortar test pieces for assessing individual unapproved constituents of these materials or associated non-cementitious products/materials.

NOTE 1 The procedure for assessing unapproved constituents is based on the assumption that constituent-specific limit values will be available for substances released from constituents where tested by a subtractive procedure within a reference concrete mix that is broadly representative of the intended use.

Each test piece is subjected to a specified preconditioning procedure where the surface which will be exposed to water intended for human consumption is brought into contact with preconditioning water during five sequential periods: three periods of 24 h, 1 period of 72 h and a final period of 24 h.

The preconditioned test piece is then brought into contact with test water, chlorinated and/or chlorine-free during three sequential migration periods. A migration period is either:

a) 72 h at (23 ± 2) °C for products or materials intended to come into contact with chlorinated or chlorine-free cold water;

b) 24 h at a specified elevated temperature for products or materials intended to come into contact with warm or hot chlorine-free water.

Migration rates are calculated after each contact period by determination of the content of specified substances in the corresponding migration water.

NOTE 2 The test is carried out under conditions that ensure that reliable migration rates are calculated. These conditions are not meant to simulate any service condition. Relating the results obtained from this European Standard to the service condition is carried out using a conversion procedure. This procedure will be specified in regulations.

NOTE 3 The selection of:

a) the appropriate test water, chlorinated and/or chlorine-free, from those made available in this European Standard;

b) the temperature of the test water;

is specified in product or system standards or in national or European regulations, as appropriate.

NOTE 4 Referring standards and/or national or European regulations may specify further sequential migration periods. Reference is made to Annex E for further guidance on the sequence and number of migration periods that can be specified.

5 Reagents

5.1 General requirements

Only use reagents of analytical quality unless otherwise stated.

5.2 Sodium hypochlorite solution

Prepared from a technical or general purpose reagent grade of sodium hypochlorite (NaOCl), using test water (5.3.2) and having a known concentration of about 0,1 % by mass of free chlorine determined in accordance with either EN ISO 7393-1 or EN ISO 7393-2.

Unless tests have proved otherwise the sodium hypochlorite solution should be considered unstable and be prepared on the day of use.

5.3 Waters to be used for testing

5.3.1 Preconditioning water prepared by dissolving (222 ± 2) mg anhydrous calcium chloride ($CaCl_2$) and (336 ± 2) mg sodium hydrogen-carbonate ($NaHCO_3$) in one litre of demineralized water (3.15). The pH is determined in accordance with EN ISO 10523 and adjusted to 7,4 ± 0,1 by bubbling air and/or CO_2 into the solution.

NOTE The target total hardness is 200 mg/l as $CaCO_3$ and the target alkalinity is 244 mg/l as HCO_3^-.

5.3.2 Test water, prepared by dissolving (110 ± 1) mg anhydrous calcium chloride ($CaCl_2$), (140 ± 1) mg sodium hydrogen-carbonate ($NaHCO_3$) and (48 ± 1) mg sodium silicate ($Na_2SiO_3 \cdot 9H_2O$) in one litre of demineralized water (3.15). The pH is determined in accordance with EN ISO 10523 and adjusted to 7,0 ± 0,1 by bubbling air and/or CO_2 into the solution.

NOTE The target total hardness is 100 mg/l as $CaCO_3$, the target alkalinity is 122 mg/l as HCO_3^- and the silica concentration is 10 mg/l as SiO_2.

5.3.3 Test water without chlorine content (chlorine-free), shall consist of a batch of test water (5.3.2) used for contact with test pieces and preparation of the blank water (3.17).

5.3.4 Test water with chlorine content (chlorinated), shall consist of test water (5.3.2) with a free chlorine content of (1,0 ± 0,2) mg/l as Cl_2, determined in accordance with either EN ISO 7393-1 or EN ISO 7393-2, after addition of sodium hypochlorite solution (5.2).

5.4 Cleaning liquids for apparatus

Use one of the following cleaning liquids:

— non-perfumed biodegradable detergent;

— hydrochloric acid, 2 mol/l;

— nitric acid, 10 % or 1,5 mol/l.

6 Apparatus

6.1 General

For cleaning the glassware, and appropriate apparatus, before use, the following general requirements apply:

a) Clean the glassware to be used, using detergent (5.4). Rinse the glassware in demineralized water (3.15).

b) Clean the inner surface of the glassware with hydrochloric acid (5.4) and rinse it with demineralized water. For stainless steel, clean with nitric acid (5.4) and then rinse with demineralized water (3.15).

c) Before use, rinse the glassware, and appropriate apparatus, at least three times using preconditioning water before preconditioning (8.2) or test water before the test procedure (Clause 9).

6.2 Apparatus and materials for test piece preparation

6.2.1 Moulds for forming test pieces

6.2.1.1 Moulds for concrete or mortar

Moulds for preparing test pieces of concrete or mortar shall be made from alkali-resistant material that does not interfere with analyses of migration waters.

A mould used to cast concrete test pieces shall normally give a test specimen with total surface area of approximately 6,0 dm^2 as appropriate to the tolerance permitted on *S*/*V* ratio, see Annex D (informative).

NOTE High density polyethylene (HDPE) containers have been found to be satisfactory for this use.

Where steel moulds conforming to the requirements of EN 12390-1 are used, the joints shall not be coated with any wax, oil or grease to achieve water tightness.

A mould used to cast mortar test pieces shall give a test specimen with total surface area of approximately 2,88 dm^2 as appropriate to the tolerance permitted on *S*/*V* ratio, see Annex D (informative).

Other mould sizes for casting concrete or mortar may be used provided the permitted tolerance on *S*/*V* ratio can be achieved during testing, see Annex D (informative).

Where a site-applied or site-formed cementitious product is not suitable for casting in a mould, e.g. some spray applied products, it should be applied and tested according to prEN 14944-3.

6.2.1.2 Cleaning and use of moulds

Clean moulds and any filling frame used with a mould, by thoroughly washing with non-perfumed detergent (5.4) and tap water (3.14), rinsing with copious amounts of tap water, followed by a final rinse with demineralized water (3.15) and dry before use.

The use of release agents to coat the internal surfaces of moulds is not permitted by this European Standard.

NOTE Release agents for use with site-applied or site-formed cementitious materials are examples of associated non-cementitious materials and are tested in accordance with Annex C (normative) of this European Standard.

6.3 Apparatus and materials for preconditioning and migration procedure

6.3.1 Vessels, containers, covers, connectors and stoppers, made of materials which do not affect the odour, flavour, colour and turbidity assessment under the specified test conditions such as glass, polytetrafluoroethylene (PTFE) or stainless steel.

The material PTFE should only be used when there is a small contact area with the test water. Thus PTFE is unsuitable for containers.

6.3.2 Equipment, capable of maintaining the test temperature (Clause 9) within ± 2 °C for the duration of the test.

6.3.3 Where required, use only **sealants** that do not affect the determinations under the specified test conditions (Clause 9).

7 Samples and test pieces

7.1 Sampling, transport and storage of samples

Sample products or materials at the point of release from the factory or production facility in accordance with the relevant product standard, system standard or the national or European regulations.

Take care that the transport conditions do not influence the test results.

If it is necessary to store samples or test pieces before testing, ensure that they are protected from contamination taking into account any written instructions that are provided.

Where appropriate, clean storage containers using the same procedures as used for the test containers.

Ensure that the surfaces of the test pieces intended to come into contact with the test water are free from any contamination, e.g. adhesive tape, labels, ink or pencil marks.

7.2 Preparation of test pieces

In the preparation of a test piece the following general principles apply:

a) ensure that test pieces are representative of the finished product;