
Vpliv cementnih proizvodov na pitno vodo - Preskusne metode - 2. del: Vpliv prehajanja snovi iz cementnih proizvodov, uporabljenih na terenu, in pripadajočih necementnih proizvodov na organoleptične parametre

Influence of cementitious products on water intended for human consumption — Test methods — Part 2: Influence of migration from siteapplied cementitious products and associated noncementitious products on the organoleptic parameters

Einfluss zementgebundener Produkte auf Wasser für den menschlichen Gebrauch - Prüfverfahren - Teil 2: Einfluss der Migration von bauseits angewendeten zementgebundenen Produkten und zugehörigen nicht zementgebundenen Produkten auf organoleptische Parameter

Ta slovenski standard je istoveten z: prEN 14944-2

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 14944-2:2023**en,fr,de**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 14944-2

April 2023

ICS

English Version

**Influence of cementitious products on water intended for
human consumption - Test methods - Part 2: Influence of
migration from siteapplied cementitious products and
associated noncementitious products on the organoleptic
parameters**

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den menschlichen Gebrauch - Prüfverfahren - Teil 2:
Einfluss der Migration von bauseits angewendeten
zementgebundenen Produkten und zugehörigen nicht
zementgebundenen Produkten auf organoleptische
Parameter

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Contents

Page

European foreword	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions	8
4 Principle.....	12
5 Reagents	12
5.1 Chlorine neutralization reagents.....	12
5.2 Waters to be used for testing.....	13
5.3 Cleaning liquids for apparatus.....	14
6 Apparatus	14
6.1 General.....	14
6.2 Apparatus and materials for test piece preparation (see Annexes A, B and C).....	14
6.3 Apparatus and materials for preconditioning and migration procedure	15
6.4 Apparatus for odour and flavour assessment	15
6.5 Apparatus for colour and turbidity assessment.....	15
7 Samples and test pieces	16
7.1 Sampling, transport and storage of samples.....	16
7.2 Preparation of test pieces	16
7.3 Surface area to volume ratio (S/V) for use in the test procedure	16
8 Pre-treatment of samples (curing and preconditioning)	17
8.1 General.....	17
8.2 Preconditioning.....	17
9 Test procedure.....	17
9.1 General.....	17
9.2 Preparation of migration water for the assessment of odour, flavour, colour, turbidity and TOC	18
9.3 Control samples (blank test)	18
10 Determination of odour as TON and flavour as TFN	18
11 Determination of colour and turbidity	19
12 Determination of TOC and calculation of test results.....	19
12.1 Determination of TOC.....	19
12.2 Calculation of test results.....	19
13 Expression of results	20
14 Test report.....	20
14.1 General.....	20
14.2 General information	20
14.3 Information on the product	21
14.4 Information on the test procedure	21
14.5 Test results.....	22

Annex A (informative) Testing and assessing organoleptic parameters and migration of organic substances (TOC) from the constituents of concrete.....	23
A.1 Introduction	23
A.2 Scope	23
A.3 Normative references	24
A.4 Terms and definitions.....	24
A.5 Principle.....	24
A.6 Reagents.....	25
A.7 Apparatus	25
A.8 Reference (or control) concrete.....	25
A.9 Sampling of constituents.....	26
A.10 Control mix, test mixes and test pieces.....	26
A.11 Concrete mixing and compacting procedure.....	28
A.12 Curing and preconditioning of test pieces.....	28
A.13 Surface area to volume (S/V) ratio.....	29
A.14 Test procedure	29
A.15 Test arrangement.....	29
A.16 Assessment of unapproved constituents	29
A.17 Test report	31
Annex B (informative) Testing and assessing organoleptic parameters and migration of organic substances (TOC) from the constituents of mortars.....	32
B.1 Introduction	32
B.2 Scope	32
B.3 Normative references	33
B.4 Terms and definitions.....	33
B.5 Principle.....	33
B.6 Reagents.....	34
B.7 Apparatus	34
B.8 Reference (or control) mortar	34
B.9 Sampling of constituents.....	35
B.10 Control mix, test mix and test pieces.....	35
B.11 Mortar mixing and compacting procedure	37
B.12 Curing and preconditioning of test pieces.....	37
B.13 Surface area to volume (S/V) ratio.....	37
B.14 Test procedure	37
B.15 Test arrangement.....	37
B.16 Assessment of unapproved constituents	38
B.17 Test report	39
Annex C (normative) Testing and assessing organoleptic parameters and migration of organic substances (TOC) from associated non-cement based products/materials.....	40

C.1	Introduction.....	40
C.2	Scope.....	40
C.3	Normative references.....	41
C.4	Terms and definitions	41
C.5	Principle.....	41
C.6	Reagents.....	41
C.7	Apparatus	41
C.8	Reference (or control) concrete/mortar.....	41
C.9	Sampling of constituents and unapproved products.....	41
C.10	Control mix, test mix and test pieces	41
C.11	Concrete/mortar mixing and compacting procedure	42
C.12	Curing and preconditioning of test pieces	42
C.13	Surface area to volume (S/V) ratio	43
C.14	Test procedure.....	43
C.15	Test arrangement	43
C.16	Assessment of unapproved products	43
C.17	Test report.....	43
Annex D (informative)	Examples of typical test pieces and test conditions as a function of S/V ratio	44
Annex E (informative)	Test arrangements for site-applied cement based materials and associated non-cement based products/materials	45
Annex F (informative)	Additional procedures for testing site-applied cement based products at elevated temperature.....	47
F.1	General.....	47
F.2	Test procedure at elevated temperature	47
F.3	Control samples (blank test)	47
F.4	Expression of results	47
F.5	Reporting	47
Annex G (informative)	Discrimination between porous and non-porous coating on site applied cement based products.....	48
G.1	Principle.....	48
G.2	Apparatus	48
G.3	Materials and reagents	48
G.4	Test procedure.....	48
G.5	Determination of pH	49
G.6	Expression of results	49
G.7	Classification criteria	49
Annex H (informative)	Schematic description of the test procedure	50
H.1	Preconditioning.....	50

H.2	Production of migration water at 23 °C.....	51
H.3	Typical Schedule	52
Annex I (informative)	Procedural tests using standard additions (positive control)	53
Bibliography		54

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[oSIST prEN 14944-2:2023](https://standards.iteh.ai/catalog/standards/sist/49d34599-5846-4a22-83da-df1b2640bd5c/osist-pren-14944-2-2023)

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European foreword

This document (prEN 14944-2:2023) 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 determine the influence(s) of site-applied cement based materials and associated non-cement based products/materials on organoleptic parameters and the migration of organic substances (TOC) in water intended for human consumption.

This document will result in one of a series of standards that support standards for the approval of products and materials in contact with water intended for human consumption.

This document is part of a series dealing with the influence of cement based and associated non-cement based products/materials on water intended for human consumption, including:

- *Part 1: Influence of factory-made cement based products on organoleptic parameters and migration of organic substances (TOC)*
- *Part 2: Influence of site-applied cement based materials and associated non-cement based products/materials on organoleptic parameters and migration of organic substances (TOC)*
- *Part 3: Migration of substances from factory-made cement based products.*
- *Part 4: Migration of substances from site-applied cement based materials and associated non-cement based products/materials.*

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1 Scope

This document specifies a method to determine the influence of site-applied cement based materials and associated non-cement based products/materials (including pre-packaged mortars) on the odour, flavour, colour, turbidity and total organic carbon (TOC) of test waters after contact with the products.

This document is applicable to site-applied or site-formed cement based 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 cement based products/materials and to associated non-cement based products/materials.

Site-applied or site-formed cement based materials which cannot be cast as cubes or prisms e.g. some spray applied systems, should be tested as factory made cement based products according to EN 14944-1.

NOTE Tests with the specified test water will not necessarily be representative of materials used in different kinds of waters and especially very soft waters.

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

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

EN 206-1, *Concrete - Part 1: 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 1420:2016, *Influence of organic materials on water intended for human consumption - Determination of odour and flavour assessment of water in piping systems*

EN 1484, *Water analysis - Guidelines for the determination of total organic carbon (TOC) and dissolved organic carbon (DOC)*

EN 1622:2006, *Water quality - Determination of the threshold odour number (TON) and threshold flavour number (TFN)*

EN 10088-1:2014, *Stainless steels - Part 1: List of stainless steels*

EN 12350-1, *Testing fresh concrete - Part 1: Sampling and common apparatus*

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 14944-2:2023(E)

EN 13055, *Lightweight aggregates*

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

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

EN 14944-1, *Influence of cementitious products on water intended for human consumption - Test methods - Part 1: Influence of factory made cementitious products on organoleptic parameters*

EN 14944-3, *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 16421, *Influence of materials on water for human consumption - Enhancement of microbial growth (EMG)*

EN 27888, *Water quality - Determination of electrical conductivity (ISO 7888:1985)*

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

EN ISO 7027, *Water quality - Determination of turbidity (ISO 7027)*

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)*

EN ISO 7393-2, *Water quality - Determination of free chlorine and total chlorine - Part 2: Colorimetric method using N,N-dialkyl-1,4-phenylenediamine, for routine control purposes (ISO 7393-2:2017)*

EN ISO 7887:2011, *Water quality - Examination and determination of colour (ISO 7887:2011)*

EN ISO 9963-2, *Water quality - Determination of alkalinity - Part 2: Determination of carbonate alkalinity (ISO 9963-2)*

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

EN ISO 16264, *Water quality - Determination of soluble silicates by flow analysis (FIA and CFA) and photometric detection (ISO 16264)*

ISO 6058, *Water quality — Determination of calcium content — EDTA titrimetric method*

3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

appropriate body

certification body, inspection body or test laboratory, as relevant to a particular requirement

3.2**cement based product**

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

3.3**cement based 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

3.4**associated non-cement based product**

product which is applied to the surface of a cement based 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

3.5**porous seal coat**

polymeric (usually organic) materials applied in a thin (25 µm – 200 µm thickness) surface layer to a cement mortar lining in order to restrict (but not prevent) interactions between the mortar and conveyed water (see Annex G)

Note 1 to entry: See also ISO 16132.

3.6**proxy sample**

sample of fresh mortar or fresh concrete taken from material to be used for the production of a factory-made product, either applied to one face of a stainless steel plate (6.2.1) using the same process of application used in the factory (mortar only) or cast into a mould (mortar or concrete) of appropriate dimensions (e.g. standard cube, cylinder or prism, etc.) and compacted (where appropriate), cured and hardened under conditions representative of those intended for the product

3.7**fresh concrete**

concrete that is fully mixed and still in a condition capable of being compacted

3.8**fresh mortar**

cement mortar that is fully mixed and still in a condition of being applied

3.9**odour**

sensation perceived by means of the olfactory organ in sniffing certain volatile substances

[SOURCE: EN ISO 5492 :2009+A1 :2017]

3.10**flavour**

complex combination of the olfactory, gustatory, and trigeminal sensations perceived during tasting

Note 1 to entry: The flavour may be influenced by tactile, thermal, painful and/or kinaesthetic effects

[SOURCE: EN ISO 5492 :2009+A1 :2017]

prEN 14944-2:2023(E)**3.11****colour of water**

optical property that causes the changing of the spectral composition of transmitted visible light measured at three wavelengths

[SOURCE EN ISO 7887:2011]

3.12**turbidity**

reduction of transparency of a water due to the presence of undissolved matter

[SOURCE EN ISO 7027-1:2016]

3.13**threshold odour number****TON**

dilution ratio of the migration water with the reference water at the same temperature, beyond which this diluted sample does not have any perceptible odour

Note 1 to entry: See EN 1622:2006

3.14**threshold flavour number****TFN**

dilution ratio of the migration water with the reference water at the same temperature, beyond which this diluted sample does not have any perceptible flavour

Note 1 to entry: See EN 1622:2006

3.15**total organic carbon****TOC**

sum of organically bound carbon present in water, bonded to dissolved or suspended matter, including cyanate, elemental carbon and thiocyanate

[SOURCE EN 1484:1997, modified]

3.16**testing panel**

group of people meeting the relevant requirements of EN 1622

3.17**test**

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

3.18**test procedure**

specified technical method for performing a test

3.19**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

3.20**test piece**

the sample or portion which is to be conditioned, treated or otherwise prepared to be tested to obtain a single test result

3.21**preconditioning**

succession of contact periods of a test piece with the preconditioning water (3.22) before contact with the test water

3.22**preconditioning water**

water used for preconditioning, prepared as described in 5.3.1

3.23**reference water**

water described as without odour, flavour, colour and turbidity conforming to the requirements in 5.3.2

3.24**test water**

water used for testing purposes, prepared as described in 5.3.3 and 5.3.4

3.25**migration water:**

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

3.26**blank water**

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

3.27**tap water**

drinking water distributed by a public supplier

3.28**demineralized water**

water of which the mineral matter or salts have been removed by deionization

[SOURCE ISO 23321:2019, 3.1]

3.29**Type I addition (cf. EN 206-1)**

nearly inert additions

Note 1 to entry: General suitability as type I addition is established for:

- Filler aggregate conforming to EN 12620 or EN 13055;
- pigments conforming to EN 12878.

3.30

Type II addition (cf. EN 206-1)

pozzolanic or latent hydraulic additions

Note 1 to entry: General suitability as type II additions is established for:

- Fly ash conforming to EN 450;
- silica fume conforming to EN 13263-1;
- ground granulated blast-furnace slag conforming to EN 15167-1.

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-cement based 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, in practice 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 intended to come into contact with chlorinated and/or chlorine-free cold water;
- b) 24 h at a specified elevated temperature for products intended to come into contact with warm or hot chlorine-free water.

After each contact period, each migration water is assessed for odour, flavour, colour, turbidity and TOC.

NOTE 2 The selection of:

- a) The appropriate test water, chlorinated and/or chlorine-free, from those made available in this document;
- b) the temperature of the test water;
- c) the need for chlorination during preconditioning;

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

5 Reagents

5.1 Chlorine neutralization reagents

5.1.1 Ascorbic acid solution, prepared by dissolving $(4,0 \pm 0,1)$ g of ascorbic acid in one litre of reference water (5.3.2).

This ascorbic acid solution shall be replaced on a monthly basis.

5.1.2 Sodium thiosulfate solution, comprising a solution of 3,5 g/l of sodium thiosulfate pentahydrate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) and stored in the absence of light at a temperature below 10 °C, for a maximum of 4 months.

5.1.3 Sodium hypochlorite solution, prepared from a commercial solution of sodium hypochlorite (NaOCl) using test water 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.

This sodium hypochlorite solution is unstable and shall be prepared on the day of use.

5.2 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 (3.28). The pH is determined in accordance with EN ISO 10523 and adjusted to $7,4 \pm 0,1$ 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 Reference water, a natural water without gas and with parameters that conform to the requirements given in Table 1.

When the reference water is chlorinated to 1,0 mg/l free chlorine and then dechlorinated after 72 h with either the ascorbic acid solution (5.1.1) or the sodium thiosulfate solution (5.1.2), its organoleptic parameters, odour, flavour colour and turbidity shall conform to the requirements given in Table 1.

When the reference water is prepared from demineralized water, dissolve (222 ± 2) mg anhydrous calcium chloride (CaCl_2), (482 ± 2) mg sodium hydrogencarbonate (NaHCO_3) and (71 ± 1) mg sodium silicate ($\text{Na}_2\text{SiO}_3 \cdot 9\text{H}_2\text{O}$) in 1 l of demineralized water (3.28). The pH is determined in accordance with EN ISO 10523 and adjusted to $7,4 \pm 0,1$ by bubbling air and/or CO_2 into the solution.

Table 1 — Reference water

Parameter	Test method ^a	Requirement	Unit
Conductivity	EN 27888	500 ± 50	$\mu\text{S}/\text{cm}$
pH	EN ISO 10523	$7,3 \pm 0,2$	pH unit
Calcium	ISO 6058	80 ± 10	mg Ca/l
Alkalinity	EN ISO 9963-2	350 ± 50	mg HCO_3^-/l
Silica	EN ISO 16264	15 ± 5	mg SiO_2/l
Odour	EN 1622	< 2	TON
Flavour	EN 1622	< 2	TFN
Colour	EN ISO 7887 ^b	$< 0,1$	m^{-1}
Turbidity	EN ISO 7027 ^c	$< 0,1$	FNU
TOC	EN 1484	$< 0,2$	mg C/l
^a Alternative methods, either calibrated against the reference methods or which have proven comparable analytical performance, may be used. ^b See Clause 5. ^c See Clause 6.			