BRITISH STANDARD

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12873-2:2005

Influence of materials on water intended for human consumption — Influence due to migration —

Part 2: Test method for non-metallic and non-cementitious site-applied materials

The European Standard EN 12873-2:2005 has the status of a British Standard

ICS 13.060.20; 67.250

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 12873-2:2005.

The UK participation in its preparation was entrusted to Technical Committee EH/6, Effects of materials on water quality, 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 committee can be obtained on request to its secretary.

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English version

Influence of materials on water intended for human consumption - Influence due to migration - Part 2: Test method for non-metallic and non-cementitious site-applied materials

Influence sur l'eau des matériaux destinés à entrer en contact avec l'eau destinée à la consommation humaine - Influence de la migration - Partie 2 : Méthode d'essai des matériaux appliqués sur site excepté les matériaux métalliques et ceux à base de ciment

Einfluss von Materialien auf Trinkwasser - Einfluss infolge der Migration - Teil 2: Prüfverfahren für vor Ort aufgebrachte nicht metallische und nicht zementgebundene Materialien

This European Standard was approved by CEN on 3 January 2005.

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.

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Contents

Foreword

This document (EN 12873-2:2005) has been prepared by Technical Committee CEN/TC 164 “Water supply”, the secretariat of which is held by AFNOR.

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 August 2005, and conflicting national standards shall be withdrawn at the latest by August 2005.

It has been drawn up with the objective to describe a test method to determine the migration of substances from non-metallic and non-cementitious materials for use in contact with water intended for human consumption.

This document will result in one of a series of standards on test methods which support the appropriate standards.

This document, part 2, is the second in a series of standards for dealing with the influence of migration from materials on water intended for human consumption, including:

— Part 1: Test method for non-metallic and non-cementitious factory made products;

— Part 2: Test method for non-metallic and non-cementitious site-applied materials;

— Part 3: Test method for ion exchange and absorbent resins;

— Part 4: Test method for water treatment membranes.

This document includes a Bibliography.

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.

Introduction

In respect of potential adverse effects on the quality of water intended for human consumption caused by the materials, it is called to mind that, while awaiting the adoption of verifiable European acceptance criteria, the relevant national regulations remain in force.

1 Scope

This document specifies a procedure to determine the migration of substances from non-metallic and non-cementitious site-applied materials for use in contact with water intended for human consumption.

It is applicable to site-applied materials intended to be used under various conditions for the transport and storage of water intended for human consumption, including raw water used for the production of water intended for human consumption. It covers the extraction by water of substances from these materials after their application on site.

The document is applicable to materials whose physical or chemical properties alter during or after on-site application, such as coatings, paints, and adhesives. In addition, some site-applied materials that do not change in such a manner, e.g. greases or lubricants, are also included.

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 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 7393-2:1985)*

3 Terms and definitions

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

3.1
test
technical operation that consists of the determination of one or more characteristics of a given product

3.2
test procedure
specified technical method for performing a test

3.3
test report
document that presents test results and other information relevant to a test

3.4
testing laboratory
laboratory that performs tests

3.5
material
manufactured items(s) for application on-site and subsequent contact with water intended for human consumption

3.6
product
material, in its finished form after application on site, that comes into contact with water intended for human consumption

3.7
test piece
product to be tested for suitability for use in contact with water intended for human consumption

3.8
tap water
water intended for human consumption (5.2.1)

3.9
test water
water used for migration testing (5.2.2 and 5.2.3)

3.10
disinfection treatment water
water used for preliminary chlorination (5.2.4)

3.11
prewashing water
water used for prewashing (5.2.5)

3.12
blank water
test water, (5.2.2 and 5.2.3) which has been kept at the same specified conditions as migration water (3.15) but without contact with test pieces

3.13
migration
movement of a substance or substances from test pieces into test water

3.14
migration period
period of time in which the migration is carried out under specified conditions

3.15
migration water
test water after exposure to a test piece under specified conditions

3.16
migration rate
mass of a measured substance or substances (in mg) migrating from one square decimetre of a test piece into the test water in one day at a specified temperature (°C)

3.17
fitting, ancillary
complete functional unit made up of one or more components or materials, parts of which are in contact with water intended for human consumption, e.g. taps, valves, water meters, water filters, pipe connectors and flexible hose assemblies

3.18
lining
layer of material applied on site and intended, as a finished product, to come into contact with drinking water, e.g. the inside surfaces of pipes, fittings or storage vessels

3.19
cure
conversion of a material into its final form; for example by chemical reaction or drying

4 Principle

Test pieces are taken on site or prepared under specific conditions that are intended to simulate site-application taking into account the manufacturer's written instructions.

Each test piece is subjected to a specified pretreatment procedure of stagnation and prewashing. The surface of the test piece, that is exposed in practice to water intended for human consumption, is brought into contact with test water during at least three sequential migration periods. A migration period is either;

— 72 h at 23 °C for products intended to come into contact with cold water.

— 24 h at a specified temperature in the range 60 °C to 85 °C for products intended to come into contact with warm or hot water.

Migration rates for the first three migration periods are determined by analysis of the required substances in the corresponding migration waters.

NOTE 1 The test is carried out under conditions to ensure that calculation of a reliable migration rate is facilitated. These conditions are not meant to simulate any service condition. Relating the results obtained from this document to the service condition is carried out using a conversion procedure. This procedure will be specified in regulations.

NOTE 2 The choice of the type of test water (chlorinated and/or chlorine free), the temperature of the test water, the number of additional migration periods and the necessity for a preliminary chlorination (see Clause 8) will be specified by product/system standards or regulations.

5 Reagents

5.1 General

For the purpose of this document, the following reagents apply.

5.2 Waters to be used for testing

5.2.1 tap water, water intended for human consumption with a free chlorine content less than 0,2 mg/l as Cl_2.

5.2.2 test water, chlorine-free water with a conductivity of < 2 mS/m and a total organic content (TOC) of < 0,2 mg/l C, e.g. prepared by reverse osmosis, deionization or distillation, followed by activated carbon filtration.

5.2.3 chlorinated test water, test water according to 5.2.2 having an active chlorine content of (1 ± 0,2) mg/l as Cl2 (5.3).

5.2.4 disinfection treatment water, test water according to 5.2.2 having an active chlorine content of (50 ± 5) mg/l as Cl2 (5.4).

5.2.5 prewashing water, tap water (5.2.1).

5.3 Cleaning liquids for glassware

5.3.1 hydrochloric acid, concentrated (30 % mass per volume) analytical reagent grade.

5.3.2 hydrochloric acid solution, prepared by slowly adding (0,5 ± 0,01) l of concentrated hydrochloric acid (5.3.1) to (0,5 ± 0,01) l of test water (5.2.2).

NOTE Care is needed because the solution may generate heat.

5.3.3 nitric acid, concentrated (65 % mass per volume) analytical reagent grade.

5.3.4 nitric acid solution, prepared by slowly adding (0,5 ± 0,01) l of concentrated nitric acid (5.3.3) to (0,5 ± 0,01) l of test water (5.2.2).

NOTE Care is needed because the solution may generate heat.

5.3.5 sulphuric acid, concentrated (density 1,84 g/ml) analytical reagent grade.

5.3.6 chromic acid, analytical reagent grade prepared by dissolving (50 ± 1) g of chromium (VI) oxide in (1 ± 0,02) l of sulphuric acid (5.3.5).

NOTE Chromic acid is a storage hazard; it may burst a sealed container due to carbon dioxide release. It is a powerful oxidant and may give potentially explosive reactions with oxidizable materials. It may ignite on contact with acetone or alcohols. When heated to decomposition it emits acrid smoke and irritating fumes.

5.4 Other reagents

sodium hypochlorite, prepared from a technical or general purpose reagent grade of sodium hypochlorite (NaOCl), using test water (5.2.2) and having a known concentration of about 0,1 % mass fraction of free chlorine determined in accordance with EN ISO 7393-2.

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

6 Apparatus

6.1 Vessels, containers, stoppers and connections, consisting of a material, such as glass, PTFE or stainless steel, which is inert under the specified test conditions (Clause 9).

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

6.2 Plates, stainless steel, mild steel, (sand blasted) glass or concrete/cement mortar plates, for testing the material. The plates must be covered completely with the test material.

6.3 Equipment, capable of maintaining the appropriate migration temperature, e.g. (23 ± 2) °C, or (60 ± 2) °C, to (85 ± 2) °C.

6.4 Cleaning, of laboratory glassware, stainless steel plates and sand blasted glass plates shall be cleaned by washing with a biodegradable laboratory detergent, followed by rinsing with either hydrochloric acid solution (5.3.2) (except for stainless steel), nitric acid solution (5.3.4) or chromic acid (5.3.6) and finally by thoroughly rinsing with test water (5.2.2). Drain the plates and dry them in a hot air cabinet.

7 Test pieces

7.1 General requirements

The manufacturer shall provide a copy of the detailed instructions for application that accompany the materials(s).

The application instructions shall cover aspects such as:

a) surface preparation;

b) mix ratios and method of mixing;

c) method of application;

d) minimum curing temperature and time;

e) product film thickness;

f) associated materials, e.g. primers and undercoats.

The manufacturer shall provide all necessary information on material and chemical safety.

Test pieces shall be prepared on site by the manufacturer/contractor under the supervision of the test laboratory in accordance with the manufacturer's written instructions. If no specialised equipment for application is required then the test pieces may be prepared by the test laboratory under conditions that simulate site application. Where it is found necessary to deviate from these instructions, this shall only be done with the prior agreement of the test laboratory and manufacturer or contractor.

If transportation of test pieces to the test laboratory is necessary, then this period of time shall be part of the curing conditions (e.g. time and temperature).

The test pieces shall be delivered within the curing period.

The test laboratory shall prepare a detailed record of test piece preparation and curing conditions.

Care shall be taken to ensure that materials and test pieces are not contaminated during transport.

7.2 Requirements for the preparation of test piece

7.2.1 Site-applied organic lining systems for pipes

7.2.1.1 Prepare test pieces in accordance with the requirements in 7.1.

NOTE It is recommended to line pipes of the smallest diameter and maximum recommended length in order to meet the requirements in 7.3.

7.2.1.2 Cut test pieces of identical length from the lined pipe.

7.2.1.3 Pretreat the test pieces according to Clause 8.

7.2.1.4 Pipes with DN > 80 shall be tested in accordance with Annex B to meet the requirements in 7.3.

7.2.2 Jointing compounds (solvent cements, adhesives)

7.2.2.1 Join eleven lengths of pipe with ten double sockets using the cement/adhesive in accordance with both the pipe/fittings and the cement/adhesive manufacturer's instructions or relevant product/system standards to give a test piece of 1 m. Where this cannot be done, use as many joints as possible in 1 m.

7.2.2.2 Cure the test pieces in accordance with the manufacturer's instructions.

7.2.2.3 Pretreat the test piece according to Clause 8.

NOTE 1 It is recommended that this test should be undertaken using the smallest diameter pipe and double-sockets in order to meet the requirements in 7.3.

NOTE 2 The pipe and double sockets to be used may be specified by either the manufacturer or in relevant product/system standards or regulations.

7.2.3 Other site-applied materials (e.g. greases and sealants)

7.2.3.1 Prepare test pieces by coating plates (6.2) and in accordance with the requirements mentioned in 7.1.

7.2.3.2 Pretreat the coated plates in accordance with Clause 8.

7.3 Surface-area-to-volume ratio (S/V)

7.3.1 Express the ratio of the surface area, S, of the test piece intended to come into contact with volume, V, of test water, per decimetre i.e. dm-1 (which is dm2/dm3 or dm2/l). A surface-area-to-volume ratio in the range 5 dm-1 to 40 dm-1 shall be used.

7.3.2 If the test piece has an irregular or textured surface then, for calculations, the surface is considered to be smooth. If the shape of the test piece is such that accurate calculation of the surface is impracticable then use an estimated surface area of the test piece. In this case the length and width shall be recorded together with a sufficiently detailed description of the product(s) to enable further test pieces to be prepared that within ± 10 % of the surface area of the original test piece.

NOTE The supplier of the test pieces should be instructed to ensure that they represent the product as it is used in contact with water intended for human consumption.

8 Pretreatment of test pieces

8.1 General

8.1.1 Test pieces are pretreated prior to migration testing by procedures involving flushing, stagnation and prewashing.

8.1.2 If required a disinfection treatment (stagnation) at (23 ± 2) °C is carried out.

NOTE The disinfection treatment is optional. The requirement to carry out this stage will be specified in the relevant product/system standard or by regulations.

8.1.3 Start the pretreatment immediately after the curing period specified by either regulations or the manufacturer, whichever is shorter.

8.1.4 If it is not possible, because of laboratory time constraints, to carry out the pretreatment and test procedure without a break, the break shall be during the pretreatment procedure. The migration periods shall be consecutive and without a break.

8.2 Test pieces to be tested at (23 ± 2) °C

8.2.1 Flushing

8.2.1.1 If possible, flush test pieces with flowing tap water (5.2.1) for (60 ± 5) min with a flushing speed of 1 m/min to 3 m/min.

NOTE In order to avoid the use of large quantities of water the arrangement described in Annex A may be used to flush large diameter products.

8.2.1.2 Test pieces which cannot be flushed shall be placed in an appropriate vessel, e.g. a bucket, having a flow of water from the bottom upwards such that the calculated speed with regard to the upper open surface of the vessel is 1 m/min to 3 m/min for (60 ± 5) min.

8.2.2 Stagnation with test water

8.2.2.1 Test pieces shall be immersed in, or filled with, test water (5.2.2 and/or 5.2.3) for a period of (24 ± 1) h at (23 ± 2) °C.

8.2.2.2 Remove the water.

8.2.2.3 Prewash the test pieces according to 8.4.

8.2.3 Stagnation with disinfection treatment water

8.2.3.1 Test pieces shall be immersed in, or filled with, disinfection treatment water (5.2.4) for a period of (24 ± 1) h at (23 ± 2) °C.

8.2.3.2 Remove the water.

8.2.3.3 Prewash the test pieces according to 8.4.

8.3 Test pieces to be tested at elevated temperature (60 °C to 85 °C)

8.3.1 Flushing

Flush test pieces according to 8.2.1

8.3.2 Stagnation with disinfection treatment water at (23 ± 2) °C

If stagnation with disinfection treatment water prior to stagnation with test water (8.3.3) is required then stagnation shall be carried out according to 8.2.3.

8.3.3 Stagnation with test water at elevated temperature

8.3.3.1 Test pieces shall be immersed in, or filled with, test water (5.2.2 and/or 5.2.3) for a period of (24 ± 1) h at the elevated temperature.

8.3.3.2 Remove the water.

8.3.3.3 Prewash the test pieces according to 8.4.

8.4 Prewashing

8.4.1 Flush test pieces according to 8.2.1

8.4.2 Rinse the test pieces with test water (5.2.2 and/or 5.2.3) for 2 min.

NOTE 1 In order to avoid the use of large quantities of water the arrangement described in Annex A may be used to flush large diameter products.

NOTE 2 The choice of the type of test water (chlorinated and/or chlorine-free) will be specified by product/system standards or regulations.

9 Test procedure

9.1 Migration of substances

9.1.1 Carry out the test for test water type (5.2.2 and/or 5.2.3).

The first migration shall be started immediately after the pretreatment.

Immerse or fill the test pieces (according to 7.2) in or with test water (5.2.2 and/or 5.2.3). In both cases, ensure that the test pieces or vessels/containers are completely immersed or filled and free of headspace in order to retain volatile substances.

NOTE 1 The number of tests to be carried out, e.g. single tests or duplicates for each water type, will be specified in regulations. As guidance the method assumes duplicate testing.

NOTE 2 The choice of the type of test water (chlorinated and/or chlorine-free) will be specified by product/system standards or regulations.

NOTE 3 Thin layer chromatography tanks (volume 3,5 to 4 l) with lids made from glass may be used as containers to carry out the tests.

9.1.2 In the case of products intended for use with cold water, each migration period shall be (72 ± 1) h at (23 ± 2) °C.

9.1.3 In the case of products intended for use with warm (60 ± 2) °C to hot water (85 ± 2) °C, each migration period shall be (24 ± 1) h.

9.1.4 At the end of each migration period remove the migration water. Replace with fresh test water as necessary. As a minimum, migration waters from the first, second and third migration period shall be analyzed. For each substance the concentration aTn (see Clause 10) shall be determined.

Product/system standards and/or regulations may specify the number of sequential migration periods to be carried out and how to interpret the data. Annex C provides examples of the sequence and number of migration periods that can be undertaken in practice.

9.2 Procedural blank tests

9.2.1 For each migration period carry out a blank test procedure, using the same test conditions (test water, test temperature, extraction periods, stoppers, pipe/pipe connectors (7.2.2.1) etc.) as described in Clause 9, but omitting the test piece.

9.2.2 Where only glass or stainless steel plates and/or stoppers are used to seal test pieces, use a glass container for the procedural blank. Where other stoppers, connectors or sealants are used (e.g. PTFE), include these in the procedural blank with the same contact condition.

9.2.3 Determine at the end of each migration period the concentration btn (see Clause 10) of each measured substance of interest.

9.2.4 If any of the blank results are greater than the relevant lowest concentration of interest for the substance determined (e.g. a value lying between the limit of detection and the concentration not to be exceeded in water intended for human consumption as specified in product/system standards or regulations) then steps shall be taken to eliminate the source of contamination, after which the entire test procedure shall be repeated.

9.3 Analysis

Carry out the required analysis on the migration waters using the respective analytical methods. Determine at the end of each migration period the concentration of the substance being measured. General guidance on analytical performance requirements such as detection limit and accuracy is contained in "Guide to analytical quality control for water analysis", EN ISO 13530.

If migration waters are not analysed immediately then ensure that the storage time and conditions do not adversely affect the analytical result.

NOTE For some analytical methods and/or specific test procedures, recovery rates for the substances being determined are established using positive controls. Annex D gives further guidance.

10 Calculation of test results

10.1 Calculation of the concentration of the substances in the migration water

NOTE The migration of substances from materials into water depends on the type of material and the migration conditions: temperature, contact time, the S/V ratio and whether the water is static or flowing. For static test conditions and constant temperature, the increase in the concentration of the substance in the test water is asymptotic. However, for practical purposes the increase with time is assumed to be linear:

Calculate for each migration water the concentration of the measured substance as follows;

$$c_n^T = a_n^T - b_n^T \quad (1)$$

where:

c_n^T is the concentration of the measured substance in mg/l;

a_n^T is the concentration of the substance in mg/l measured in the migration water;

b_n^T is the concentration of the substance in mg/l measured in the blank water.

For the conditions:

T is the test temperature [(23 ± 2) °C or (60 ± 2) °C to (85 ± 2) °C];

n is the sequence number of the migration period (1, 2, 3, …10).

10.2 Calculation of the migration rate of the measured substances

Calculate for each migration water the migration rate M_n^T for a migrated substance from the concentration c_n^T as follows:

$$M_n^T = \frac{c_n^T}{t \times S/V} \quad [\text{mg dm}^{-2}\text{d}^{-1}] \quad (2)$$

where:

M_n^T is the migration rate for the n'th migration period (3.14);

t is the duration of the migration period in days, either one day (24 ± 1) h for elevated temperatures or three days (72 ± 1) h for (23 ± 2)°C (9.1.2 and 9.1.3);

S/V is the surface area-to-volume ratio in dm^{-1} (7.3.1).

10.3 Calculation of the mean migration rate

Calculate the arithmetic mean migration rate $\overline{M}_n^T$ for the duplicate values of M_n^T for each test water (5.2.2 and 5.2.3).

11 Test report

11.1 General information

The dated test report shall include the following general information:

a) name and address of test laboratory and location where the test was carried out when different from the address of the testing laboratory;

b) unique identification of report (such as serial number) and of each page, and total number of pages of the report;

c) name and address of client;

d) description and identification of the test item;

e) the proposed use of the product;

f) a signature and title or an equivalent marking of person(s) accepting technical responsibility for the test report and date of issue;

g) a statement to the effect that the test results relate only to the items tested;

h) a statement that the report shall not be reproduced except in full without the written approval of the testing laboratory;

11.2 Information on the material

The information on the material shall at least include the following:

a) trade name or designation of manufactured material;

b) complete identification and date of receipt of test item and date of performance of test;

c) the names of the primers and undercoats used, together with the wet film thickness of each lining applied;

d) details of the test piece preparation;

e) the name of the manufacturer of the material;

f) the production place and date;

g) the organisation submitting the material;

h) description of sampling procedure.

11.3 Information on the test pieces

The information on the test piece shall include at least the following:

a) typical uses of the material;

b) source of application instructions;

c) site of test piece preparation, including ambient temperature and humidity (if appropriate);

d) person(s) responsible for test piece preparation;

e) date and time of test piece preparation;

f) full details of test piece preparation, including component part mix ratios (if appropriate), method of application (brush, airless spray etc), number and type of component layers (coats), thickness of each

layer, time and temperature of curing of both top and any intermediate coats, any special curing conditions (e.g. controlled humidity);

g) chain of custody of the test pieces; method of transfer to the test laboratory and temperature profiles of the test pieces during transport to the laboratory for final curing;

h) date and time of receipt of the test pieces by the test laboratory;

i) test piece description;

j) date and time of the start of testing;

k) any deviations from the manufacturer/supplier application instructions.

11.4 Information on the test procedure

The information on the test procedure shall include the following:

a) reference to this document and (if applicable) to relevant product/system standards and/or regulations;

b) number of test pieces used together in a migration;

c) volume of the test liquid (V) in litres;

d) surface area of test piece exposed to the test liquid (S) in square decimetres calculated from the actual dimensions of the test pieces;

e) actual S/V ratio;

f) disinfection procedure (if applicable) ;

g) source of test water and (if applicable) details of preparation;

h) test waters and test temperature;

i) any deviation from the test procedure specified in this document;

j) any factors which may have affected the results, such as any incidents or any operating details not specified in this document;

k) dates of start and completion of the test.

11.5 Test results

The test results shall, at least, include the duplicate and mean results and calculations shall be presented for each test temperature and type of test water in tabular form, e.g.:

	Sequence number of migration period			
	1	2	3	n[a]
a_n^T				
b_n^T				
c_n^T				
M_n^T				
$\overline{M}_n^T$				

[a] n specifies additional migration periods.

Annex A
(informative)

Arrangement for flushing pipes with nominal size greater than DN 80

An alternative arrangement for flushing large diameter products is shown in Figure A.1

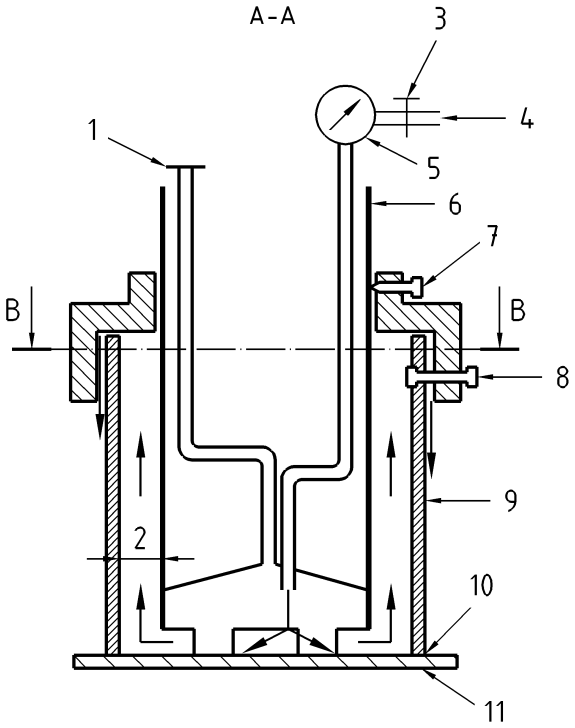
This arrangement is designed to avoid the use of large quantities of water to produce the required flow rate over the test piece surface.

The device is a cylinder made of inert material (6.1) with a diameter less than that of the internal diameter of the test piece.

The diameter of the cylinder should be at least 10 mm less than that of the internal diameter of the test piece. This will leave a gap of at least 5 mm between the wall of the cylinder and the test piece. If the gap is any smaller than this, there will be too much resistance to the water flow.

The tap water is delivered via a valve and flow meter through a pipe to a space at the bottom of the cylinder. The cylinder is supported on the base plate by three or four short legs. The space into which the pipe delivers the water is to allow for equal flow of water over the whole inside of the test piece. The space has an air vent, which is opened, at the start of the prewashing period in order to let out the air, which would otherwise be trapped in the distribution space. Most of the volume of the cylinder is empty space which can be filled with e.g. water or sand in order to stabilize the set up.

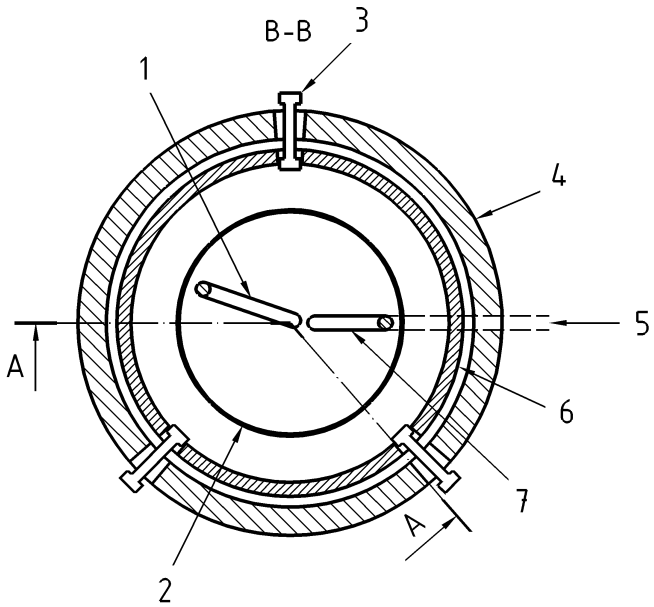
Towards the top of the cylinder there is an adjustable ring with three or four screws to adjust the height of the ring for different lengths of test pieces. There are also three or four screws which can be tightened into the outside of the test piece in order to ensure that the cylinder is centered within the test piece, thus ensuring equal flows of water over the whole inside surface of the test piece. The position of the ring is adjusted to allow a free flow of water over the top edge of the test piece. A vertical gap of about 10 mm should be sufficient.



Key

1	Air vent5Flow meter	5	Flow meter	9	Test piece
2	Gap > 5mm	6	Main cylinder	10	Seal
3	Valve	7	Height adjusting crew	11	Base plate
4	Wash water	8	Centering screw		

Figure A.1a) — Example of an arrangement for flushing large diameter pipes



Key

1	Air vent	5	Wash water
2	Main cylinder	6	Test piece
3	Centering screw	7	Water inlet
4	Adjustable ring		

Figure A.1b) — Example of an arrangement for flushing large diameter pipes

Annex B
(normative)

Additional procedure for testing non-homogeneous products and pipes with nominal size greater than DN 80

B.1 Arrangement for testing

Use the test arrangements shown in Figure B.1.

Take precautions to ensure that there is no loss of test water during the migration periods.

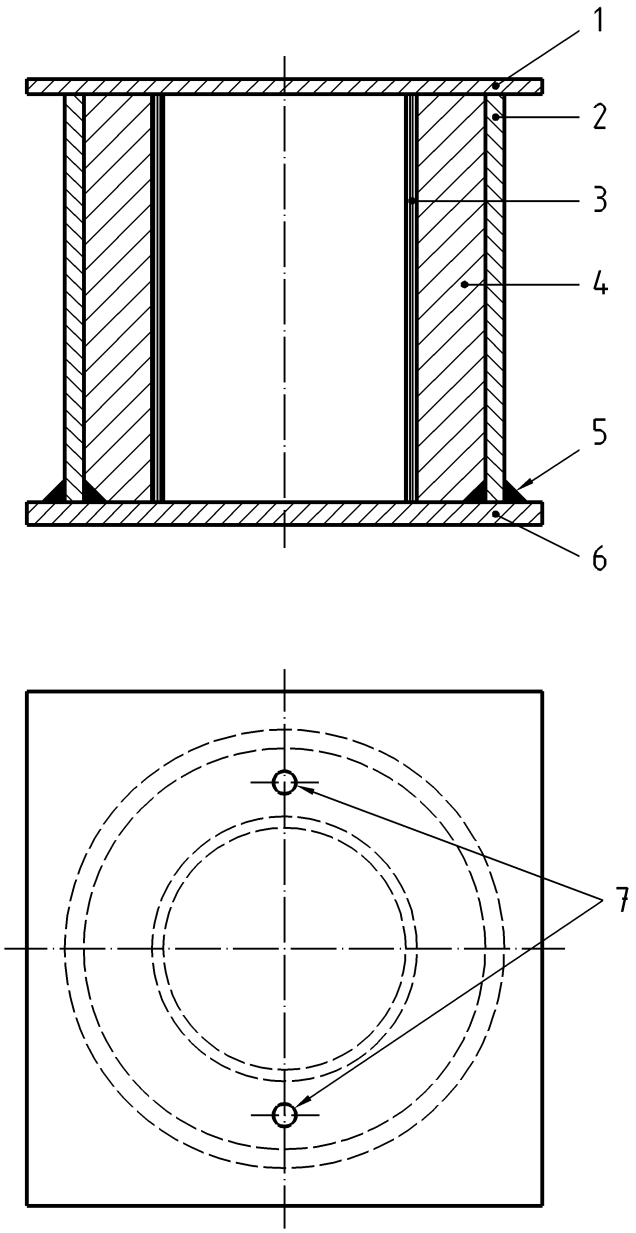
B.2 Flushing of the test piece

Flush the test piece in accordance with either Clause 8 or, to avoid the use of large quantities of water, the procedure given in Annex A.

In case of dispute, use the procedure given in Clause 8.

B.3 Blank test

Carry out the blank test in accordance with 9.2, ensuring that all materials that will come into contact with the test liquid will be included in the blank test and that they are present at the same surface-area-to-volume ratio as in the actual test arrangement.



Key

1 Top plate of glass or stainless steel
2 Pipe wall
3 Cylinder of glass or stainless steel
4 Test water (test piece completely filled)
5 Seal between pipe section and plate, if necessary
6 Bottom plate of glass or stainless steel
7 Hole in top plate for filling with test water and release of air (sealed with stoppers)

Figure B.1 — Test arrangement

Annex C
(informative)

Sequence of additional migration periods in the migration test

C.1 Introduction

The number of migration periods will be specified in either product/system standards or regulations. In addition these sources will specify whether any migration water after the third migration has to be analysed; analysis may be required also for the 10th migration water.

C.2 Migration tests

If more than three migration periods are specified by the product/system standard(s) or by regulations some allowance for the timing of the intermediate migrations (between the third and the final migration) can be introduced to assist the test laboratory. In every case, however, the migration water immediately before the final migration for analysis should be of the correct duration.

In Table C.1 an acceptable sequence for obtaining migration waters is shown for 72 h periods. Table C.2 shows this sequence for 24 h periods.

Table C.1 — Sequence for obtaining migration water for 72 h extraction periods

Number migration period	Days	Comment
1	Tuesday to Friday	72 h – analysed
2	Friday to Monday	72 h – analysed
3	Monday to Thursday	72 h – analysed
4	Thursday to Monday	96 h
5	Monday to Wednesday	48 h
6	Wednesday to Friday	48 h
7	Friday to Tuesday	96 h
8	Tuesday to Friday	72 h
9	Friday to Monday	72 h - analysed[a]
10	Monday to Thursday	72 h - analysed
[a] If required		

Table C.2 — Sequence for obtaining migration water for 24 h migration periods

Number migration period	Days	Comment
1	Tuesday to Wednesday	24 h – analysed
2	Wednesday to Thursday	24 h – analysed
3	Thursday to Friday	24 h – analysed
4	Friday to Monday	72 h
5	Monday to Tuesday	24 h
6	Tuesday to Thursday	48 h
7	Thursday to Friday	24 h
8	Friday to Monday	72 h
9	Monday to Tuesday	24 h
10	Tuesday to Wednesday	24 h – analysed [a]
[a] If required		

Annex D
(informative)

Procedural tests using standard additions (positive controls)

Establishing recovery levels of substances determined from analytical methods and specific test procedures is good laboratory practice, when carried out periodically. Any requirements for particular products will be specified in the product/system standards or regulations.

a) A positive control should be included, where appropriate, in order to ensure that there are no significant losses of the measured substance, migrating from the test piece, during the extraction periods or during sampling for analysis (e.g. by evaporation, adsorption on test vessels, etc.).

b) A solution of known concentration of the substance to be determined should be prepared using the test water and further treated as described in 9.2 (Procedural blank tests).

c) If the recovery of the substances does not meet the requirement specified in either the product/system standard or by regulations, then the whole test procedure should be checked, and if necessary repeated, until the required performance is obtained.

Annex E
(informative)

Flow diagrams for migration test procedure for cold water temperature and elevated temperature

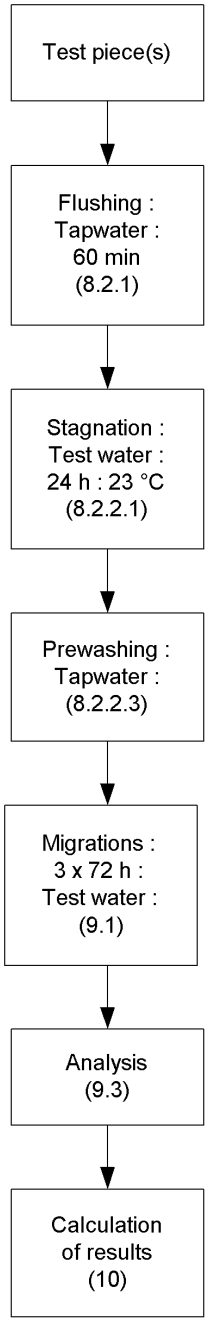


Figure E.1 — Testing at 23 °C without high level disinfection

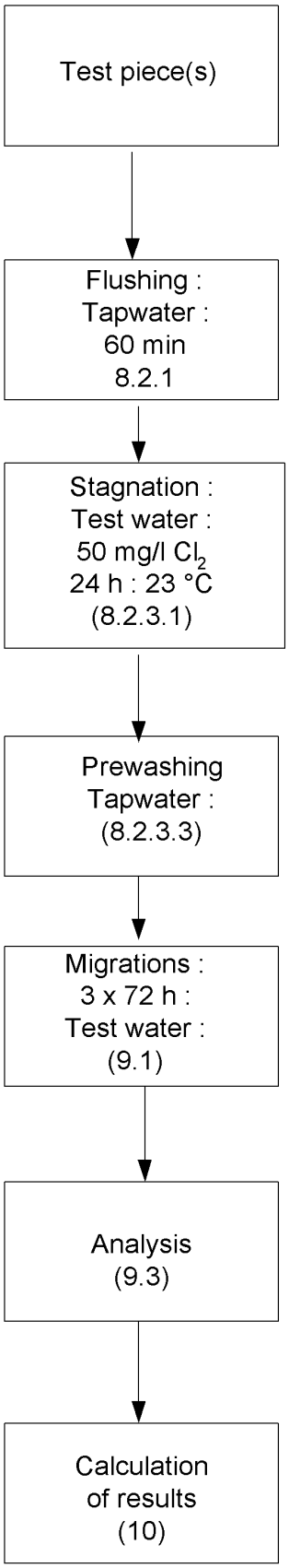


Figure E.2 — Testing at 23 °C with high level disinfection

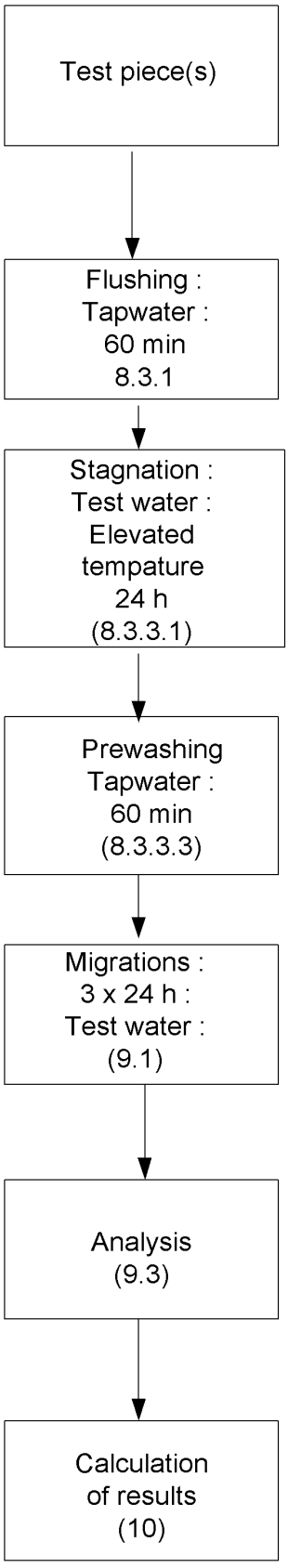


Figure E.3 — Testing at elevated temperature without high level disinfection

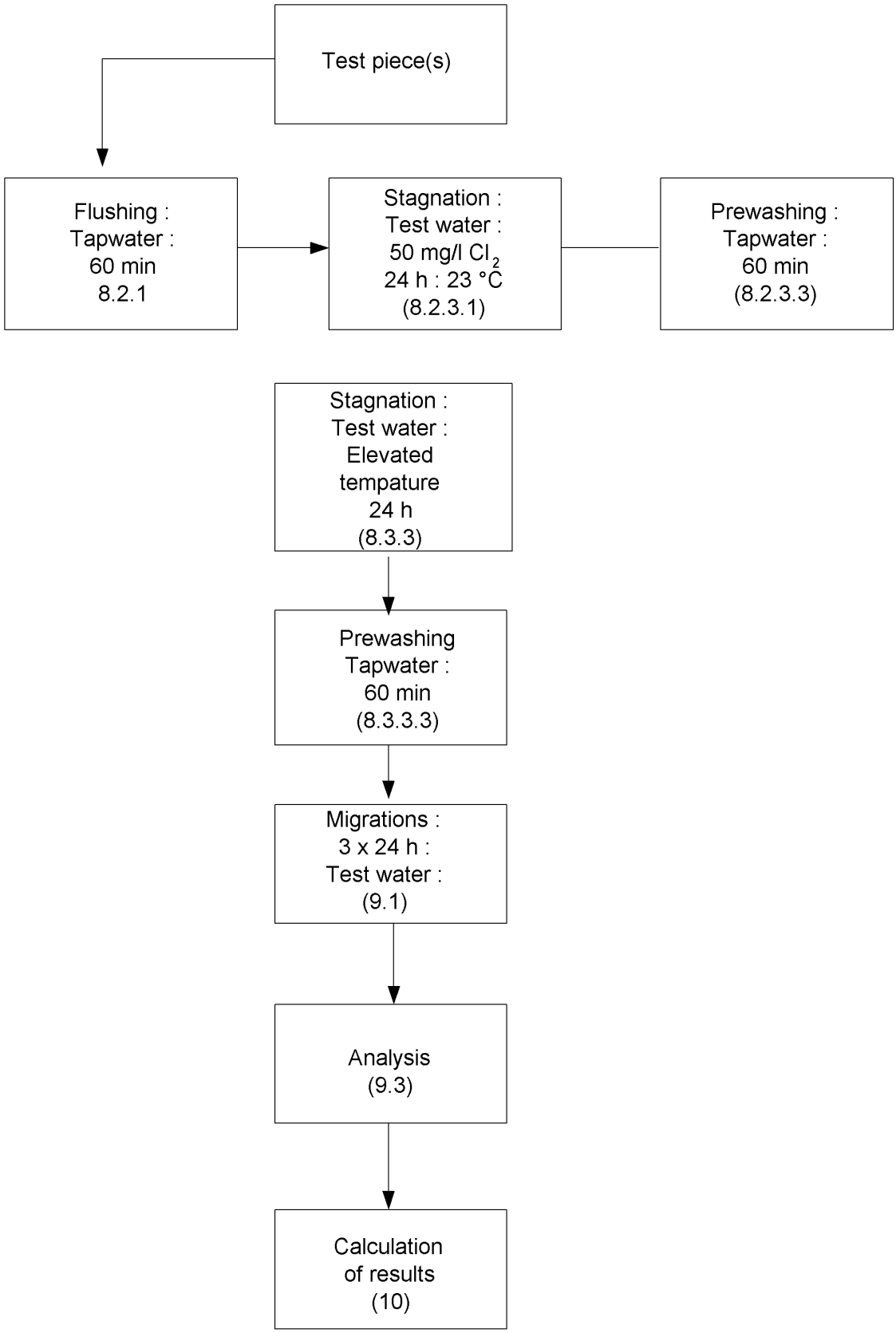


Figure E.4 — Testing at elevated temperature with high level disinfection

blank

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