BRITISH STANDARD

BS EN
13052-1:2001

Influence of materials on water intended for human consumption — Organic materials — Determination of colour and turbidity of water in piping systems —

Part 1: Test method

The European Standard EN 13052-1:2001 has the status of a British Standard

ICS 13.060.20; 13.060.60; 23.040.01

National foreword

This British Standard is the official English language version of EN 13052-1:2001.

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 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.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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This British Standard, having been prepared under the direction of the Health and Environment Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 16 November 2001

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Influence of materials on water intended for human consumption — Organic materials — Determination of colour and turbidity of water in piping systems — Part 1: Test method

Influence des matériaux sur l'eau destinée à la consommation humaine — Matériaux organiques — Evaluation de la couleur et de la turbinité de l'eau dans les réseaux de conduites — Partie 1: Méthode d'essai

Einfluss von Werkstoffen auf Wasser für den menschlichen Gebrauch — Organische Werkstoffe — Bestimmung von Färbung und Trübung von Wasser in Rohrleitungssystemen — Teil 1: Prüfverfahren

This European Standard was approved by CEN on 17 August 2001.

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Contents

Foreword

This European Standard 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 March 2002, and conflicting national standards shall be withdrawn at the latest by March 2002.

This European Standard has been prepared by CEN/TC 164, Water supply, in co-operation with CEN/TC 155, Plastics piping systems and ducting systems, and consists of two parts:

Part 1: Test method;

Part 2: Interpretation of laboratory values relative to field-use conditions.

This standard is Part 1. It contains the two following annexes.

Annex A, which is informative, describes an arrangement for flushing large diameter pipes.

Annex B, which is informative, summarizes schematically the relationship between the various stages of the document.

The material-dependent parameters and/or performance requirements are incorporated into the Product Standards, for example the System Standards for plastics piping systems.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

In respect of potential adverse effects on the quality of water intended for human consumption caused by the materials, it is recalled to mind that, while awaiting the adoption of verifiable European acceptance criteria, such as proposed in a future *European Acceptance Scheme,* national regulations remain in force.

1 Scope

This standard specifies a method for determining the colour and turbidity of test waters after their contact with the organic materials used in piping systems. The term ‘‘products’’ comprises pipes, fittings, ancillaries including their coatings and joints.

The test method described in this standard is applicable to products to be used under various conditions for the transport of water intended for human consumption and raw water used for the manufacture of water intended for human consumption. Coatings or protective layers on products which are not intended to be in contact with these types of water are not covered by this method.

This standard specifies the test method comprising a set of procedures with and without a disinfection pretreatment and possible temperatures for the test waters. The use of the disinfection pretreatment and the choice of the test temperature are dependant on the relevant national regulations and/or the system or product standards.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN ISO 7027:1999, *Water quality — Determination of turbidity (ISO 7027:1999).*

EN ISO 7393-2:2000, *Water quality — Determination of free chlorine and totalchlorine — Part 2: Colorimetric method using N, N-diethyl-1, 4-phenylenediamine for routine control purposes (ISO 7393-2:1985).*

EN ISO 7887:1994, *Water quality — Examination and determination of colour (ISO 7887:1994).*

3 Terms and definitions

For the purpose of this standard the following terms and definitions apply:

3.1
colour
optical property that causes the changing of the spectral composition of transmitted visible light measured at three wavelengths (see clause 3 of EN ISO 7887:1994)

3.2
turbidity
reduction of transparency of a liquid caused by the presence of undissolved matter (see clause 3 of EN ISO 7027:1999 as a source of this definition)

3.3
reference water
water complying with the following requirements without and with addition of 1 mg/l chlorine

— for colour: spectral absorption coefficient less than 0,1 m^{-1};
— for turbidity: FNU < 0,1

3.4
test waters
water used for testing purposes as described in 5.2.2 and 5.2.3

3.5
migration water
test water (see 3.4) which has been in contact with a test piece under specified conditions

3.6
blank water
test water (see 3.4) which has been kept at the same specified conditions as migration water but without contact with the test piece(s)

3.7
flushing water
tapwater distributed by a public supplier

3.8
disinfection treatment water
water containing chlorine as described in 5.1.2

3.9
fitting, ancillary
complete functional unit made up of one or more components and materials, parts of which are in contact with drinking water, e.g. taps, valves, water filters

3.10
product
a manufactured item, in its finished form

3.11
sample
one or more units, or specified quantity, drawn from a batch or lot, selected at random for inspection, e.g. in a laboratory

3.12
specimen
a single sample of a product, to be prepared to obtain a single test result

3.13
test piece
the specimen or portion which is conditioned, treated or otherwise prepared to be tested to obtain a single test result

4 Principle

Following a defined pretreatment procedure of flushing, stagnation with or without disinfection and then prewashing, the surface of the test pieces, exposed in practice to drinking water, is brought into contact with test waters.

The migration procedure is carried out three times on the same test piece under specified conditions as follows:

Test pieces are put in contact with chlorinated and unchlorinated waters for 72 h at 23 °C, or put in contact with unchlorinated water for 24 h at specified temperature in the range 60 °C to 85 °C.

After this contact, the migration water is assessed for colour and turbidity.

Additional information is given in the relevant product standard, system standards or in a future European Acceptance Scheme concerning:

— the temperature to be used in the test;
— the need for a disinfection pretreatment;
— the need to carry out a 23 °C test, using chlorinated water, for products being tested at elevated temperatures.

5 Reagents

5.1 Disinfection reagents

5.1.1 Sodium hypochlorite solution, prepared from a commercial solution of sodium hypochlorite (NaOCl) and having a known concentration of about 0,1 % by mass of free chlorine determined in accordance with EN ISO 7393-2:2000.

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

5.1.2 Disinfection treatment water**,** shall consist of a batch of reference water (see 5.3.3) with a free chlorine content of (50 ± 5) mg/l as Cl_2 after addition of sodium hypochlorite solution (see 5.1.1).

5.2 Waters to be used for testing

5.2.1 Reference water shall be without colour and turbidity.

5.2.2 Test water without chlorine content, shall consist of a batch of reference water (see 5.3.3) used for contact with test piece(s)and preparation of the blank water.

5.2.3 Test water with chlorine content, shall consist of a batch of reference water (see 5.3.3) with a free chlorine content of (1 ± 0,2) mg/l after addition of sodium hypochlorite solution (see 5.1).

5.3 Cleaning liquids for apparatus

— biodegradable detergent;

— hydrochloric acid, 2 mol/l (analytical grade);

— nitric acid, 10 % or 1,5 mol/l (analytical grade);

— hydrogen peroxide, 3 % vol/vol (analytical grade).

6 Apparatus

6.1 Apparatus for migration assessment

The following equipment shall be used:

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

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.

6.1.2 Equipment, capable of maintaining the test temperature within ± 2 °C, for the duration of the test.

6.2 Apparatus for colour and turbidity assessment

The following apparatus shall be used:

6.2.1 Apparatus for colour analysis complying with the requirements of EN ISO 7887:1994, 3.5.

6.2.2 Apparatus for turbidity analysis complying with the requirements of EN ISO 7027:1999, 6.3.

7 Samples of product and test pieces

7.1 General

7.1.1 Sampling of products shall be performed in accordance with the relevant product standard, system standard or the national regulations when applicable.

7.1.2 If it is necessary to store samples before testing, they shall be protected from contamination. If the manufacturer provides written storage instructions they shall be followed.

The samples shall be stored in their original form as delivered.

Where appropriate, storage containers shall be cleaned using the same procedures as are used for the test containers.

7.1.3 The test pieces shall be prepared such that only the surface intended to come into contact with drinking water is exposed to the test waters (see 5.2.1 and 5.2.2). Where the composition of the test piece is homogeneous, it is acceptable to immerse the whole test piece in the test water.

7.1.4 If the preparation procedure for a test piece for a particular type of product has not been covered in this standard, deviation from this procedure is allowable under the following conditions:

a) the finished product and the test piece shall be produced in the same manner;

b) the preparation of test pieces before testing shall include the procedures which are performed in practice before the system is put into operation, e.g. curing and cleaning procedures.

7.1.5 Ensure that the surface of the test pieces intended to come into contact with test water shall be free from adhesive tape, labels, ink or pencil marks. Care shall be taken that the transport conditions do not influence the test results.

7.1.6 The minimum age of the test pieces shall conform to the relevant product standard or system standard or, if not given in such a standard, to that recommended by the manufacturer for the product to be ready for use.

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

7.2.1 General

The surface area of the test pieces exposed to the test water shall relate to realistic conditions and are expressed in Table 1.

The surface-area-to-volume ratio, S/V, shall be expressed per decimeter, i.e. dm^{-1} (dm^2/dm^3 or dm^2/l), where:

S is the surface area of the test piece in contact with the test water, in square decimetres;

V is the volume of test water, in litres.

7.2.2 Pipes

For each test, take from a pipe a specimen of sufficient length to give the internal volume (V) of the test water necessary. Some typical S/V ratios are given in Table 1.

When no difference in material composition and production process exists in the range of sizes produced, testing of the smallest size is sufficient.

Table 1 — Typical internal S/V ratios for pipes

Application group	Typical internal diameter mm	Typical S/V dm^{-1}
Pipes inside buildings (domestic pipes)	16	25
Service pipes	40	10
Distribution pipes	160	2,5
Trunk mains	400	1,0

7.2.3 Fittings, ancillaries and joints

7.2.3.1 For each test take one or more fittings, ancillaries or joints to give a sufficient volume of water for the colour and turbidity assessment. This volume of test water is V litres.

The test pieces for the different types shall conform to Table 2, except that when no difference in the material composition and production process exists in the range of types of products, testing of the largest S/V ratio is sufficient.

Table 2 — S/V ratios of fittings, ancillaries and joints

Type of fitting, ancillary or joint	Approx. S/V dm^{-1}
Fittings, ancillaries	1,5
Elastomeric membranes	0,4
Adhesives Elastomericseals Solvent cements	0,2

7.2.3.2 When the outside and the inside surfaces of the product have a different material composition the product may be tested in the form of a more convenient test piece, prepared under the same manufacturing and processing conditions as for the product.

8 Preparation of reagents and apparatus

8.1 Reference water

Determine that the water conforms to 3.3 for colour and turbidity.

8.2 Test water with chlorine content

Add a sufficient quantity of sodium hypochlorite solution (see 3.1) to the reference water (see 3.3) to give a final concentration of (1,0 ± 0,2) mg/l free chlorine as Cl_2.

8.3 Disinfection treatment water

Add a sufficient quantity of sodium hypochlorite solution (see 5.1.1) to the reference water (see 3.3) to give a final free residual chlorine of (50 ± 5) mg/l as Cl_2.

8.4 Cleaning of the apparatus

8.4.1 Clean the glassware to be used, using detergent (see 5.3). Rinse the glassware with reference water (see 3.3) and then clean the inner surface.

8.4.2 Clean the inner surface of the glassware with hydrochloric acid (see 5.3) and rinse it in reference water (see 3.3). For stainless steel, clean with nitric acid (see 5.3) and then rinse it in reference water (see 3.3).

If further cleaning of the inner surface is necessary, repeat the cleaning using hydrogen peroxide (see 5.3) followed by rinsing with reference water (see 3.3).

8.4.3 Before use, rinse the glassware *and apparatus* at least three times, using reference water (see 3.3).

9 23 °C test procedure

9.1 General

9.1.1 Wherever possible subject the test pieces to stagnation (see 9.3), prewashing (see 9.4) and migration (see 9.5) by filling. Flushing (see 9.2) and rinsing (see 9.4.2) shall be carried out by passing water through the test piece.

If this is not possible for shape and for size reasons, immerse the test pieces in glass containers for these procedures. Flushing and rinsing are then carried out by passing water over the test piece in a suitable container.

9.1.2 The following procedures shall be performed at (23 ± 2) °C. Where tests are required to be performed at elevated temperature, follow the procedures described in clause 10.

9.1.3 Perform the procedures in the following sequence: flushing (see 9.2), stagnation (see 9.3), prewashing (see 9.4), migration (see 9.5) and finally colour and turbidity assessment of the migration water (see B.1).

If it is not possible for laboratory time constraint reasons to carry out the test procedures without a break, the break shall be during the pretreatment procedures. However, the migration periods shall be consecutive and without a break.

Ensure that surfaces which are not intended to be in contact with drinking water shall not come into contact with the test water during the test.

9.2 Flushing

9.2.1 Connect test pieces (see clause 7) to a source of flushing water (see 3.7) and flush the test piece with prewashing water (see 3.7) for (60 ± 5) min with a speed of 1 m/min to 3 m/min.

NOTE For practical reasons, an alternative arrangement described in annex A may be used when the flow of water required with large diameter products exceeds the available water supply.

9.2.2 Place test pieces which cannot be flushed like pipes in an appropriate vessel (e.g. a bucket) having a water throughflow 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.

9.3 Stagnation

If disinfection treatment is required, carry out stagnation in accordance with 9.3.1. If not then follow 9.3.2.

9.3.1 Stagnation with disinfection water

9.3.1.1 Fill or immerse the test pieces (from 9.2) using disinfection treatment water (see 8.3) and allow to stand at (23 ± 2) °C for (24 ± 1) h.

9.3.1.2 After this period, discard the disinfection treatment water and carry out prewashing in accordance with 9.4.

9.3.2 Stagnation without disinfection water

9.3.2.1 Fill or immerse the test pieces (from 9.2) using reference water (see 3.3) and allow to stand at (23 ± 2) °C for (24 ± 1) h.

9.3.2.2 After this period, discard the reference water and carry out prewashing in accordance with 9.4.

9.4 Prewashing

Prewashing shall be carried out in two stages, flushing (see 9.4.1) and rinsing (see 9.4.2).

9.4.1 Flushing

Carry out in accordance with 9.2.

9.4.2 Rinsing

Rinse the test pieces by either filling and emptying or immersing them three times with fresh reference water (see 3.3). Immediately after completion of the rinsing procedure perform migration procedure in accordance with 9.5.

9.5 Migration

Carry out the following procedure in duplicate using reference water (see 3.3) and test water with chlorine (see 5.2.2).

9.5.1 Fill or immerse the test pieces using the appropriate test water and allow to stand for (72 ± 1) h at (23 ± 2) °C. At the end of this period, collect the migration waters and immediately assess them for colour and turbidity in accordance with clause 11.

9.5.2 Repeat 9.5.1 two more times using fresh test waters, ensuring that the test pieces are put in contact with the same type of test waters for all the three periods.

9.5.3 Carry out a blank test in parallel using the same test conditions in order to obtain the blank waters (see 3.6).

10 Elevated temperature test procedure

10.1 General

10.1.1 Wherever possible subject the test pieces to stagnation (see 10.3 and 10.5) and migration (see 10.7) by filling. Flushing (see 10.2 and 10.4) and rinsing (see 10.6) are carried out by passing water through the test piece.

If this is not possible for shape and for size reasons, immerse the test pieces in glass containers for these procedures. Flushing and rinsing are then carried out by passing water over the test piece in a suitable container.

10.1.2 Carry out the procedures in the following sequence: flushing (see 10.2), stagnation (see 10.3), flushing (see 10.4), elevated temperature stagnation (see 10.5), rinsing (see 10.6) and migration (see 10.7) and finally colour and turbidity assessment of the migration water (see B.2).

10.1.3 Perform the procedure described in 10.5 (elevated temperature stagnation), 10.6 (rinsing) and in 10.7 (migration) at the test temperature specified either in national regulations or in referring standards. If this information is not available, perform these steps at 60 °C or 85 °C.

Perform all other procedures at (23 ± 2) °C.

10.2 Flushing

10.2.1 Connect test pieces (see clause 7) to a source of flushing water (see 3.7) and flush the test piece with this prewashing water for (60 ± 5) min with a speed of 1 m/min to 3 m/min.

NOTE For practical reasons, an alternative arrangement described in annex A may be used when the flow of water required with large diameter products exceeds the available water supply.

10.2.2 Place test pieces which cannot be flushed like pipes in an appropriate vessel (e.g. a bucket) having a water throughflow 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.

10.3 Stagnation

If disinfection treatment is required, carry out stagnation in accordance with 10.3.1. If not required then follow the procedure in 10.3.2.

10.3.1 Stagnation with disinfection water

10.3.1.1 Fill or immerse the test pieces using disinfection treatment water (see 8.3) and allow to stand at (23 ± 2) °C for (24 ± 1) h.

10.3.1.2 After this period, discard the disinfection treatment water and carry out prewashing in accordance with 10.4.

10.3.2 Stagnation without disinfection water

10.3.2.1 Fill or immerse the test pieces (from 10.2) using reference water (see 3.3) and allow to stand at (23 ± 2) °C for (24 ± 1) h.

10.3.2.2 After this period, discard the reference water and carry out flushing in accordance with 10.4.

10.4 Flushing

Carry out in accordance with 10.2.

After completion perform elevated temperature stagnation in accordance with 10.5.

10.5 Elevated temperature stagnation

10.5.1 Fill or immerse the test pieces (from 10.4) using reference water (see 3.3) and allow to stand at the test temperature (see 10.1.3) for (8 ± 0,5) h.

10.5.2 Discard the water and replace with fresh reference water (see 5.2.1) and allow to stand at the test temperature for (16 ± 0,5) h.

10.5.3 Discard the water and perform rinsing in accordance with 10.6.

10.6 Rinsing

Rinse the test pieces (from 10.5) by either filling and emptying or immersing them three times in reference water (see 3.3). Immediately after completion of the rinsing procedure perform migration procedure in accordance with 10.7.

10.7 Migration

Carry out the following procedure using test water without chlorine (see 5.2.2) at the test temperature detailed in 10.1.3.

10.7.1 Fill or immerse the test pieces using the test water (see 5.2.2) and allow to stand for (24 ± 1) h at the test temperature. At the end of this period, collect the migration water and allow to cool to the temperature required for colour and turbidity assessment and then assess for colour and turbidity in accordance with clause 11.

10.7.2 Repeat 10.7.1 two more times using fresh test water without chlorine (see 5.2.2).

10.7.3 Carry out a blank test in parallel using the same test conditions in order to obtain the blank waters (see 3.6).

11 Determination of colour and turbidity

Assess the blank and migration waters after each migration period in accordance with clause 3 of EN ISO 7887:1994 for colour and 3.3 of EN ISO 7027:1999 for turbidity.

12 Expression of results

The results for each migration period shall be expressed in:

— spectral absorption coefficient at 3 wavelengths for colour according to clause 3 of EN ISO 7887:1994;

— FNU for turbidity according to 3.3 of EN ISO 7027:1999.

13 Test report

The dated test report shall include the following information:

13.1 General information

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

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

— name and address of client;

— description and identification of the test item;

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

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

— a statement that the report shall not be reproduced except in full without the written approval of the testing laboratory.

13.2 The information on the product shall at least include:

— trade name or designation of manufactured product;

— complete identification and date of receipt of test item and date of performance of test;

— details of the test piece preparation;

— the name of the manufacturer of the product;

— the production place and date;

— the organization submitting the sample;

— the organization responsible for preparing the samples;

— description of sampling procedure.

13.3 Information on the procedure

The information on the procedure shall include:

— reference to this standard and (if applicable) to the referring standard or national regulation;

— number of test pieces used together in a migration;

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

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

— actual S/V ratio;

— disinfection procedure (if applicable);

— source of reference water and (if applicable) details of preparation;

— test waters and test temperature;

— any deviation from the test procedure specified in this standard;

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

— dates of start and completion of the test.

13.4 Test results

The test results shall at least include:

— the colour and turbidity for the three migration periods for the chlorinated and unchlorinated migration waters and blank waters.

Annex A
(informative)
Arrangement for flushing large diameters pipes

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

This arrangement is designed to produce the required flow rate over the surface of the test piece, while using the minimum quantity of water.

The device is a cylinder made of inert material (see 7.1.1) with a diameter less than that of the internal diameter of the test piece.

It is essential for the diameter of the cylinder to 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 possibly be too much resistance to the waterflow.

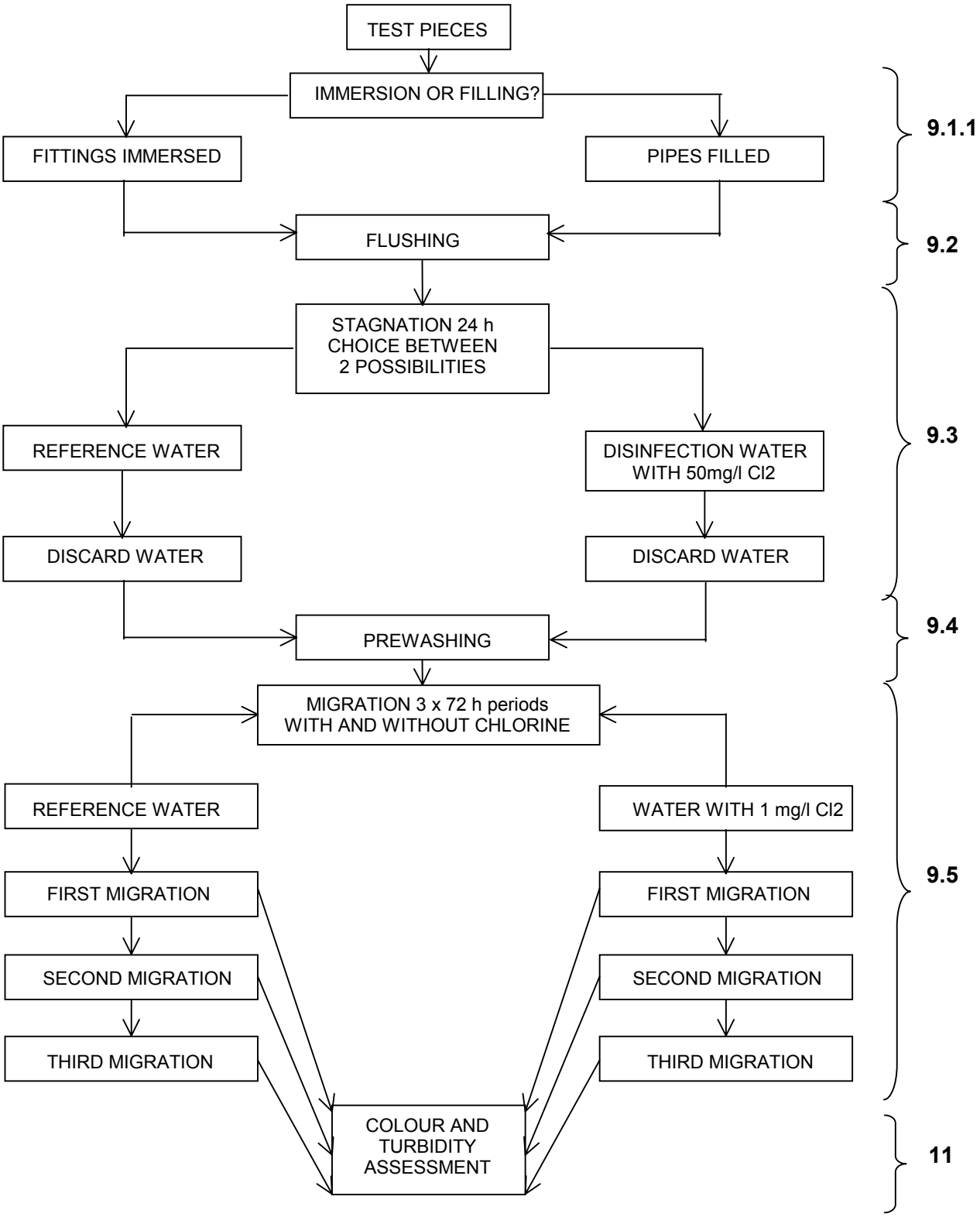
The wash water is delivered from a mains tap via a valve and flow meter through a pipe to a space at the bottom of the cylinder. The cylinder is supported on the base plate by three or four short legs. The space into which the pipe delivers the water is to allow for equal flow of wash water over the whole inside of the test piece. The space has an air vent which is opened at the start of the washing 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 setup.

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 pieces in order to ensure that the cylinder is centred within the test piece, thus ensuring equal flows of wash 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.

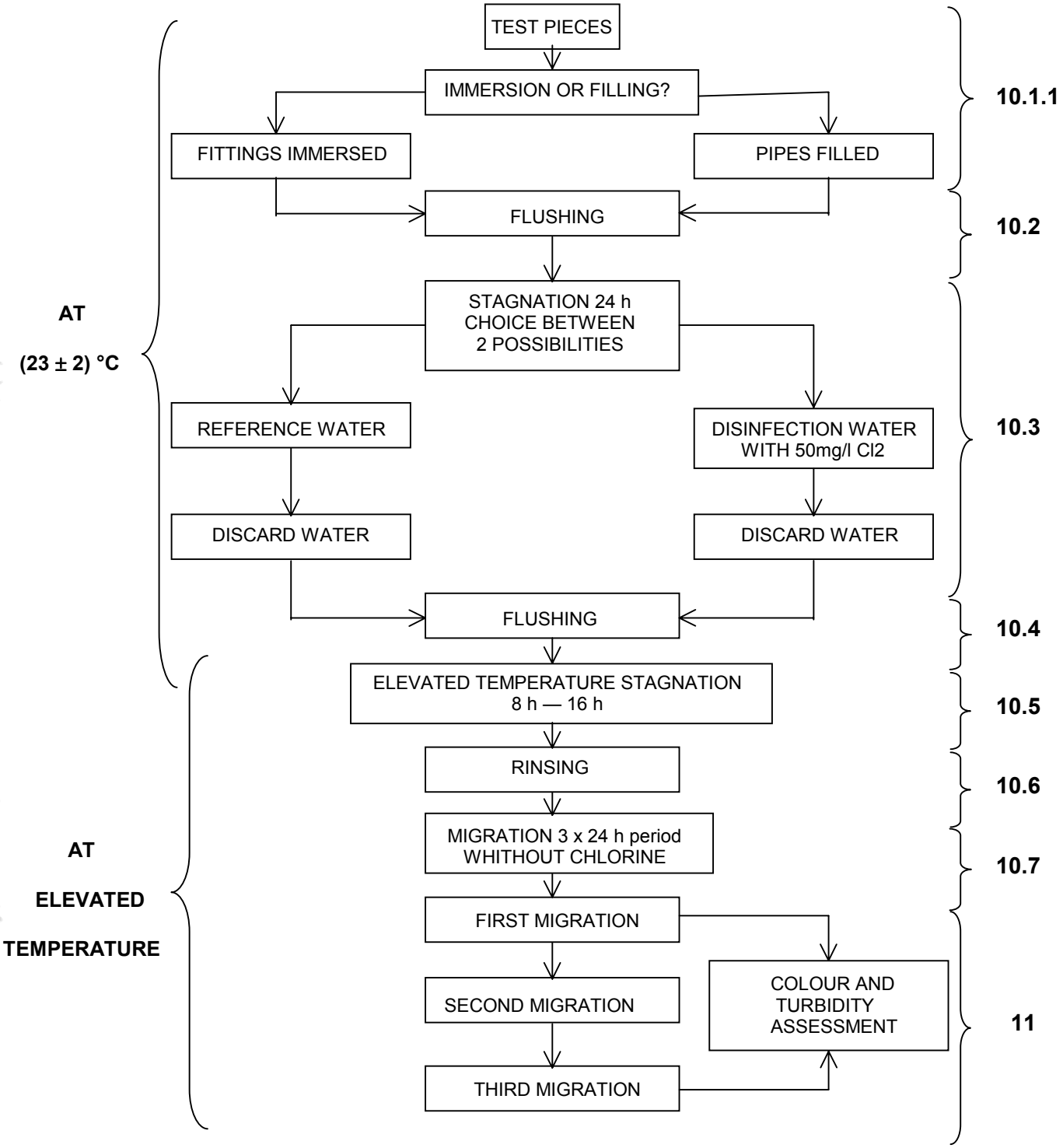
Annex B
(informative)
Schematic presentation of the test method

Figures B.1 and B.2 of this annex show schematically the relation between the different procedures described in this European Standard.

B.1 Products to be tested at (23 ± 2) °C



B.2 Products to be tested at elevated temperatures



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