BRITISH STANDARD

BS EN 476 : 1998

General requirements for components used in discharge pipes, drains and sewers for gravity systems

The European Standard EN 476 : 1997 has the status of a British Standard

ICS 91.140.80

National foreword

This British Standard is the English language version of EN 476 : 1997.

The UK participation in its preparation was entrusted by Technical Committee B/505, Wastewater, to Subcommittee B/505/1, General requirements for pipes and fittings, 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.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 12, an inside back cover and a back cover.

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EUROPEAN STANDARD
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EN 476

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Descriptors: Sanitation, water removal, water flow, sewage, junctions, water pipelines, piping, specifications, performance evaluation, dimensions, tests, marking

English version

General requirements for components used in discharge pipes, drains and sewers for gravity systems

Prescriptions générales pour les composants utilisés dans les réseaux d'évacuation, de branchement et d'assainissement, à écoulement libre

Allgemeine Anforderungen an Bauteile für Abwasserkanäle und -leitungen für Schwerkraftentwässerungssysteme

This European Standard was approved by CEN on 1997-06-14. 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.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. EN 476 : 1997 E

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 165, Waste water engineering, the Secretariat of which is held by DIN.

This European Standard provides the basis for the preparation or revision of product standards for discharge pipes, drains and sewers operating as gravity systems (see clause **1** 'Scope').

Components meeting the requirements of this European Standard and in permanent or in temporary contact with water intended for human consumption, will not adversely affect the quality of that water. Therefore this standard does not contravene the EC-Council Directives 75/440, 79/869 and 80/778.

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 January 1998, and conflicting national standards shall be withdrawn at the latest by January 1998.

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 and the United Kingdom.

Contents

1 Scope

This European Standard specifies general requirements for components such as pipes, fittings and manholes with their respective joints intended for use in discharge pipes, drains and sewers which operate as gravity systems where any pressure likely to occur is a maximum of 40 kPa.

This European Standard provides the general basis for the preparation or revision of product standards. It is not applicable for the evaluation of products.

It is applicable as a reference for drawing up a product specification, if there is no product standard available.

This European Standard includes marking, quality control and certification requirements.

This European Standard comprises:

- common requirements for all components;
- specific requirements for discharge components for use inside buildings or attached to the external surfaces of buildings;
- specific requirements for components for use in drain and sewer systems.

In product standards, combinations of these requirements may be applied where appropriate, e.g. for the components buried in the ground inside the building structure.

This European Standard covers components to be used in conveying in a satisfactory manner:

- domestic waste water;
- rainwater and surface water; and,
- other waste waters (e.g. industrial waste water) that will not damage the components.

This European Standard applies to components of circular and other cross-sections.

This European Standard applies equally to components which are factory-made and to those constructed on site, where applicable.

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 standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN ISO 9001	*Quality systems — Model for quality assurance in design, development, production, installation and servicing* (ISO 9001 : 1994).
EN ISO 9002	*Quality systems — Model for quality assurance in production, installation and servicing* (ISO 9002 : 1994)
EN 45011	*General criteria for certification bodies operating product certification*
EN 45012	*General criteria for certification bodies operating quality system certification*
ISO 48	*Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

3 Definitions, symbols and abbreviations

For the purposes of this standard the following definitions apply:

3.1 external diameter OD

Mean external diameter of the pipe barrel at any cross-section. For pipes with external profiles on the barrels, the external diameter is the maximum diameter when viewed in cross-section.

3.2 factory production control

Surveillance mode in which a manufacturer performs its own surveillance on the result of its production according to a set of rules formally specified in quality assurance or quality management provision.

3.3 flexible pipe

Pipe, the load carrying capacity of which is limited by diametral deformation under load to the ultimate design criteria without breaking or overstressing.

3.4 gravity system

System where flow is caused by the force of gravity and where the pipe normally operates partially full.

3.5 invert

Lowest point of the internal surface of the barrel of a pipe or channel at any cross-section.

3.6 internal diameter ID

Mean internal diameter of the pipe barrel at any cross-section.

3.7 joint

Connection between the adjacent ends of two components including the means of sealing.

3.8 nominal size DN

Numerical designation of size of component, which is a convenient integer approximately equal to a manufacturing dimension in mm. This can apply to either the internal diameter (DN/ID) or the external diameter (DN/OD).

3.9 pipe barrel

Cylindrical part of the pipe with a uniform cross-section excluding socket and spigot.

3.10 proof load

Specified test load which a component withstands where the related requirements of the product standard are met.

3.11 quality control system

Organizational structure, responsibilities, procedures, processes and resources for implementing quality management.

3.12 rigid pipe

Pipe, the load carrying capacity of which is limited by breaking or overstressing, without significant deformation of its cross-section.

3.13 ring stiffness

Resistance of a pipe to diametral deflection in response to external loading applied along one diametric plane given as follows:

$$S = \frac{EI}{D^3_m}$$

where :

- S is the ring stiffness of the pipe in kilonewtons per square metre;
- E is the modulus of elasticity in flexure in the circumferential direction, in kilonewtons per square metre;
- I is second moment of area of the pipe wall in the longitudinal direction, per unit length, in metres to the fourth power per metre;
- D_m is the diameter of the neutral axis of the pipe wall, in metres.

3.14 semi-rigid pipe

Pipe, the load carrying capacity of which is limited by diametral deformation or by breaking or overstressing.

3.15 surface water

Water drained from the surface of buildings, structures or the ground.

3.16 ultimate load

Load which causes failure as defined in product standards.

4 General functional and dimensional requirements

Product standards may include specifications which are more stringent, but not less stringent than those in this standard.

4.1 Dimensions of pipes and fittings

4.1.1 *Nominal sizes*

Nominal sizes DN shall be given in product standards as DN/ID or DN/OD.

Nominal sizes specified in product standards shall preferably be selected from table 1 or table 2.

Other nominal sizes may be specified in product standards.

Table 1. Nominal sizes: DN/ID
30, 40, 50, 60, 70, 80, 90, 100, 125, 150, 200, 225, 250, 300, 400, 500, 600, 800, 1000, 1200, 1400, 1600, 1800, 2000, 2200, 2500, 2800, 3000, 3500, 4000

Table 2. Nominal sizes: DN/OD
32, 40, 50, 63, 75, 90, 100, 110, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1200, 1400, 1600, 1800, 2000

NOTE. For each material, it is intended to limit the number of nominal sizes.

4.1.2 *Internal diameters and limit deviations*

Product standards shall specify:

- internal diameters and limit deviations; or
- external diameters, wall thicknesses and limit deviations; or
- minimum bores. (see **7.1**)

Maximum limit deviations on the internal diameter ID are in table 3.

Table 3. Maximum limit deviations on internal diameters

Nominal size	Limit deviations on mean internal diameter mm	Limit deviations on individual internal diameter mm
DN ≤ 100	± 0,05 DN	± 0,1 DN
100 < DN ≤ 250	± 5	±10
250 < DN ≤ 600	± 0,02 DN	± 0,04 DN
DN > 600	± 15	± 30

NOTE. DN in table 3 can be applied to either DN/ID or DN/OD.

4.2 Geometry of pipes

Pipe straightness shall be within tolerances specified in product standards (see **7.2**).

The angle between the planes of the end face of the pipe and the longitudinal axis of the pipe shall be 90° with a tolerance such that the function of the pipe joint shall not be impaired (see **7.3**).

A range of pipe lengths may be specified in product standards.

Product standards shall specify tolerances on pipe lengths, even if the lengths themselves are not specified.

4.3 Geometry of fittings

4.3.1 *General*

Angles for fittings shall be stated in product standards.

Preferred angles for fittings are 11° 15′, 15°, 20° to 22° 30′, 30°, 45°, 67° to 70° and 87° to 90°. Other angles may be allowed in product standards.

4.3.2 *Bends*

The minimum radii '*r*' of bends, defined at their axes, having angles *α* greater than 70° and internal diameters greater than 200 mm, shall be 0,7 times the internal diameter (see figure 1).

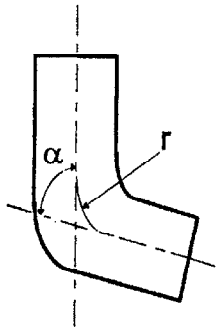

Figure 1. Illustration of radius 'r' and angle 'α' bend

4.4 Smoothness of bore

Interior surfaces of pipes and fittings shall be free from visible defects that may adversely affect their hydraulic performance. Product standards shall specify the acceptable imperfections or a hydraulic performance test.

4.5 Appearance and soundness

Pipes, fittings and joints shall be free from defects which could impair their performance in service.

4.6 Longitudinal bending moment resistance

Product standards shall state for long, rigid or semi-rigid pipes of small diameters, longitudinal bending moment resistance in kilonewtons per metre or bending load for a specified span and loading condition in kilonewtons. Alternatively, maximum values of length to diameter ratios shall be given in product standards (see **7.4**).

NOTE. This is to help avoid problems when transporting, lifting, handling and installing pipes.

4.7 Interconnection

Product standards shall state whether or not components within dimensional series (or tolerances) are capable of interconnection.

Where such interconnection is not confirmed, product standards shall specify the means (e.g. adaptors) required to effect interconnection.

4.8 Corrosion resistance

Pipes, fittings, joints, inspection chambers and manholes shall be resistant to corrosion by domestic waste water, surface water and the effects of soil and ground water. Corrosion resistance tests may be specified in product standards.

4.9 Abrasion resistance

Pipes and fittings shall be resistant to abrasive effects of hard particles in domestic waste and surface water. Abrasion resistance tests may be specified in product standards.

4.10 Modification

Any modification on site shall be carried out in accordance with appropriate product standards and/or manufacturer's instructions, without adversely affecting functional requirements.

4.11 Coatings and linings

Coatings, linings or other protective measures may be specified in product standards. It may be necessary to specify additional protection for joints.

4.12 Long-term behaviour

Where appropriate, long-term behaviour of components shall be specified in product standards.

4.13 Durability

Product standards shall give details of durability characteristics of the finished product.

4.14 Sealing elements

Sealing elements as specified by the component manufacturer, shall normally be supplied together with the components.

5 Functional requirements for discharge components inside buildings

5.1 General

Where the term: 'inside buildings' is used in the context of components fixed inside buildings, it also includes discharge pipes and fittings fixed on external surfaces of buildings.

5.2 Strength of pipes

Appropriate strength requirements for pipes shall be given in product standards.

5.3 Watertightness

Pipes, fittings and joints for use in discharge pipes inside buildings shall withstand internal hydrostatic pressure, without leakage.

Components, including joint assemblies, shall satisfy a pressure test from 0 kPa rising to 50 kPa, without leakage (see **8.1**).

Moisture adhering to the external surfaces shall not constitute leakage.

The above requirement does not apply to rainwater systems fixed externally to the building.

5.4 Airtightness

Joint assemblies intended for use as discharge pipes inside buildings, excluding rainwater systems fixed externally to the building, shall satisfy an internal air pressure test from 0 kPa rising to 1 kPa (see **8.3**).

5.5 Temperature

Pipes, fittings and joints excluding rainwater systems shall be suitable for a maximum intermittent waste water temperature of 95 °C, at the point of entry to the pipe system (see **8.2**).

5.6 Thermal expansion

Product standards shall state the coefficient of thermal expansion, where appropriate.

6 Functional and dimensional requirements for drains and sewers that are generally buried

6.1 Dimensions of manholes and inspection chambers

Dimensions of manholes with access for personnel shall comply with the safety requirements in force at the place of installation.

6.1.1 *Manholes with access for cleaning and inspection by personnel*

Manholes for all maintenance works with access for personnel shall have a DN/ID 1000 or greater, or a nominal size for rectangular sections of 750 × 1200 or greater, or a nominal size for elliptical sections of 900 × 1100 or greater (see figures 2a) and 2b)).

6.1.2 *Manholes with access for cleaning and inspection*

Manholes for the introduction of cleaning equipment, inspection and test equipment with occasional possibility of access for a man equipped with a harness, shall have a DN/ID of 800 or greater but less than 1000 (see figure 2c)).

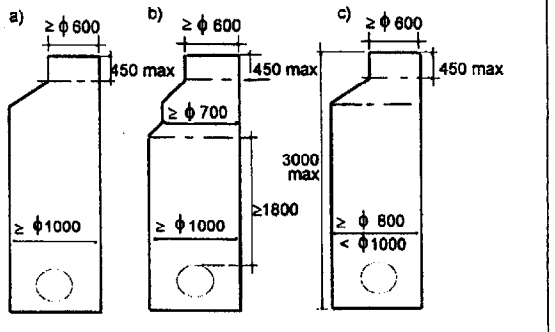

Figure 2: Examples of circular manholes

6.1.3 *Inspection chambers*

Inspection chambers having DN/IDs less than 800 permit the introduction of cleaning, inspection and test equipment but do not provide access for personnel.

6.1.4 *Steps*

Where steps are incorporated in a manhole component, the product standard shall specify the load requirements and test methods.

6.2 Continuity of invert

Joints, when checked in the factory shall have continuity of invert within the following calculated maximum tolerances: (see **9.1**.)

– up to and including DN/OD 315 or DN/ID 300: 6 mm step;

– greater than DN/OD 315 or DN/ID 300: 0,02 mm × DN, no step to be greater than 30 mm.

6.3 Load bearing capacity and stiffness

Pipes and, where appropriate, fittings, shall be classified according to their characteristic structural behaviour.

Product standards shall state:

– minimum crushing strengths, in kilonewtons per metre;

– or minimum stiffness values, in kilonewtons per square metre;

– or both requirements;

– and/or any other relevant requirements, such as creep values.

Strength or stiffness classes, if more than one, shall be separated by at least 20 % of the next lower value.

NOTE. The behaviour of the components may depend on:

– the material, particularly its ability to either deform, and/or crack and/or rupture at failure under load;

– the geometry, diameter, shape and wall thickness;

– the mechanical characteristics of the surrounding materials and support, after installation.

Pipes can be defined as flexible, rigid or semi-rigid as in clause **3**.

The failure load for flexible, semi-rigid or rigid pipes causes excessive deformation or rupture or unacceptable cracking of the pipes and can lead for example to: buckling of the wall, significant creep in the material, unacceptable cracking of coatings, loss of tightness in joints and reduction in hydraulic capacity.

6.4 Strength of manholes, shafts and inspection chambers above the base unit

6.4.1 *General*

Crushing strength and/or stiffness requirements for manholes, shafts and inspection chambers are dependent on the location of installation (e.g. carriageways, hard shoulders, parking areas). Strength or stiffness classes, if more than one, shall be separated by at least 20 % of the next lower value.

6.4.2 *Circular sections*

Circular sections shall have minimum crushing strengths and/or stiffness values, whichever is applicable, stated in product standards (see **9.3**).

Rigid circular sections shall have a minimum crushing strength of 25 kN per metre length per metre internal diameter for nominal sizes less than or equal to DN 1000. For nominal sizes greater than DN 1000 the minimum crushing strength shall be 25 kN per metre length, or 30 kN per metre length if tested in a vertical position (see **9.3**).

Flexible circular sections for use in carriageways, hard shoulders and parking areas shall have a minimum initial stiffness value of 1,5 kN/m^2.

6.4.3 *Other shapes*

Requirements for other shapes of construction shall be comparable to the requirements of **6.4.2** (see **9.3**).

6.4.4 *Tapers and reducing slabs*

Requirements for tapers and reducing slabs shall be specified in product standards.

For use in carriageways, hard shoulders and parking areas, tapers shall withstand an ultimate load of 300 kN (see **9.5**) and reducing slabs shall withstand an ultimate load of at least 300 kN or a proof load of 120 kN (see **9.4**).

6.5 Watertightness

6.5.1 *General*

Pipes, manholes, inspection chambers, fittings and joints intended for use in buried drains and sewers shall withstand, without leakage, an internal hydrostatic pressure test (see **9.6**).

Moisture adhering to the external surfaces shall not constitute leakage.

Where the watertightness of the joint assembly is mainly dependent on internal pressure, an additional external hydrostatic pressure test or a partial vacuum test shall be carried out.

6.5.2 *Product test pressures*

Pipes, manholes, fittings and joints shall satisfy a pressure test from 0 kPa rising to 50 kPa.

Inspection chamber assemblies designed to be used at depths less than or equal to 2,0 m shall be tested by an hydrostatic pressure equal to the pressure of water when totally filled.

Shafts of inspection chamber assemblies designed to be used at depths greater than 2,0 m shall be tested as manholes.

6.6 Temperature

Pipes, fittings and joints shall be suitable for a continuous water discharge temperature of 45 °C in the case of DNs less than or equal to 200, or of 35 °C for DNs over 200.

Temperature resistance tests may be specified in product standards.

6.7 Dimensional stability

For flexible and semi-rigid pipes and fittings, the admissible deformation shall be stated in product standards by giving both short-term and long-term values.

A test for buckling shall be stated in product standards, where appropriate.

7 General test methods

Details of test methods shall be stated in product standards.

7.1 Measurement of diameters and wall thicknesses

7.1.1 *Mean internal diameter of barrels*

Where measurement of internal diameter is a requirement of the product standard, it shall be carried out near all ends of the component. At least two measurements shall be taken near each end and the mean internal diameters calculated. The measurements shall be taken at approximately equal angular spacing.

7.1.2 *Mean external diameter of barrels*

Where measurement of external diameter is a requirement of the product standard, it shall be carried out near all ends of the component in a similar manner to that in **7.1.1**, or by calculation from the circumference near all ends of the component.

7.1.3 *Wall thickness of barrels*

Where measurement of wall thickness is a requirement of the product standard, it shall be carried out near all ends of the component. Thickness shall be measured near each end at a minimum of four points, taken at approximately equal angular spacing. Alternatively minimum and maximum values shall be determined near each end.

7.2 Measurement of deviation from straightness of barrels

Where measurement of deviation from straightness is a requirement of the product standard, the method of measurement shall be stated. Deviation shall be measured at the centre point of a line of length not less than two thirds of barrel length.

7.3 Measurement of deviation from squareness of the ends of the pipes

Where measurement of deviation from squareness is a requirement of the product standard, the method of measurement shall be stated.

7.4 Longitudinal bending moment resistance test for pipes

Where there is a longitudinal bending moment resistance requirement in the product standard, the following test criteria shall apply:

- the test shall be carried out on a test machine having a load recording facility;
- the pipe to be tested shall be supported at each end and symmetrically loaded (3 or 4 point loading) so that it will break with one circumferential crack;
- the span shall be not less than 5 × DN, expressed in millimetres;
- the supports shall be designed to produce vertical reactions only.

8 Test methods for discharge components for use inside buildings

Details of test methods shall be stated in product standards.

8.1 Watertightness test

The watertightness test shall be carried out on one or more pipes or pipe sections at ambient temperature, under hydrostatic pressure as stated in **5.3**.

The test pieces shall be clamped into suitable testing apparatus. They shall be filled with water and completely vented. They may be preconditioned with water prior to testing.

The test method, the test period, the water added to maintain the test pressure and, where applicable, the angular deflection shall be stated in product standards.

8.2 Elevated temperature cycling test

The test shall be carried out on a test assembly, including pipes and fittings, defined in product standards.

The test assembly shall be subjected to the passage of hot and cold water according to the following schedule for 1500 cycles:

a) (30 ± 1) l of water at a temperature of (93 ± 2) °C over a period of 1 min, at a constant rate of flow;

b) rest and drain period of 1 min;

c) (30 ± 1) l of water at a temperature of (15 ± 5) °C over a period of 1 min, at a constant rate of flow;

d) rest and drain period of 1 min.

The water temperature is measured at the point of entry.

When filled with water (15 ± 5) °C to a pressure of 35 kPa at the lowest point and a minimum of 5 kPa at the inlet point, the test assembly shall not leak either before or after thermal cycling.

8.3 Airtightness test

Product standards shall state a test method to assess the compliance of the joint assembly with the requirement of **5.4**.

9 Test methods for components for drains and sewers outside buildings

Details of test methods shall be stated in product standards.

9.1 Continuity of invert

Product standards shall detail the dimensions or the method of calculation or the test method by means of which compliance with **6.2** shall be demonstrated.

9.2 Crushing/stiffness tests for pipes

9.2.1 *Crushing test*

The test shall be carried out on a test machine having:

– a load recording facility;

– a stiff loading beam the lower face of which is a bearer having an elastomeric bearing strip of thickness from 10 mm to 40 mm and hardness between 45 IRHD and 65 IRHD (International Rubber Hardness Degree) in accordance with ISO 48.

The maximum width of the bearing strip shall be:

DN ≤ 400: 50 mm

400 < DN ≤ 1200 : 0,12 mm × DN, expressed in millimetres

DN > 1200: 150 mm

– a lower bearer on which is located a V shaped support which is either covered with or has two bearing strips of elastomeric material having the same thickness and hardness as that on the loading beam. Where the included angle (β) of the V is 170° or more, the crushing strength shall be as recorded. Where (β) is less than 170°, a reduction factor shall be applied to the recorded strength as given in table 4.

Table 4. Reduction factors for V shaped support

Angle	150° ≤ β < 160°	160° ≤ β < 170°	$\beta \geq 170°$
Reduction factor	0,98	0,99	1,00

The test consists of subjecting a complete pipe or pipe section to the action of a uniformly distributed load. For example, bearers may be divided into sections to achieve uniform distribution.

The test load shall be applied symmetrically over the entire bearer length. The position of the load may be adjusted to maintain stability.

During application of at least the final third of the specified load, the rate of increase of load shall be constant and this period of loading shall be at least 30 s.

Where the cross-section of the pipe does not allow the test method to be used, the product standard shall state an appropriate test method to obtain a comparable strength assessment.

9.2.2 *Stiffness test*

This test shall be carried out on a test machine, having load and deformation recording facilities. The product standard shall state whether the bearer and the beam shall be flat steel plates (with no bearing faces or strips) or as described in **9.2.1**.

The determination of ring stiffness and creep value shall be specified in each product standard.

9.3 Crushing/stiffness tests for sections of manholes and shafts

Elements shall be tested in accordance with **9.2**, except that for convenience, it is permitted to carry out the test in the vertical position.

9.4 Loading test for reducing slabs

The test shall be carried out on a test machine having a load recording facility.

During application of at least the final third of the specified load, the rate of increase of load shall be constant and this period of loading shall be at least 30 s. The load shall be applied to a complete reducing slab, until either the proof or ultimate load, as required, is achieved.

9.5 Loading test for tapers

Where a loading test for tapers is a requirement in the product standard, a test method shall be given in the product standard.

9.6 Watertightness tests

9.6.1 *Test for pipes*

The watertightness test shall be carried out at ambient temperature, under hydrostatic pressure as stated in **6.5.2**.

The test pieces shall be clamped into a suitable test apparatus. They shall be filled with water and vented. They may be preconditioned with water prior to testing.

The test method, the test period and the test requirements (e.g. water added to maintain the test pressure) shall be stated in product standards.

9.6.2 *Test for pipe joints*

These tests are for joints between two pipes, and a pipe and a manhole base or an inspection chamber base.

The tests shall be carried out on pipes or pipe sections jointed and supported in such a way that they can move in relation to each other to the limits of the requirements stated in product standards.

These shall include tests for joint deflection and shear or a combination of both, under hydrostatic pressure as stated in **6.5.2**. Where appropriate, shear shall be replaced by diametral deflection.

Minimum joint deflection values '*a*' as illustrated in figure 3 shall be as follows:

DN < 300 : 30 mm

300 ≤ DN ≤ 600 : 20 mm

600 < DN ≤ 1000 : 10 mm

$$DN > 1000 : 10 \times \frac{1000}{DN} \text{ mm}$$

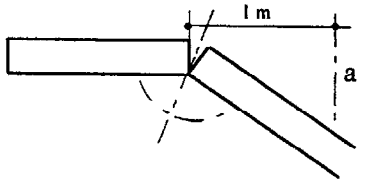

Figure 3. Joint deflection

Minimum shear load values in the joint shall be 10 N × DN.

The minimum diametral deflection applied to the spigot near the joint shall be 5 % of the external pipe diameter.

NOTE. Product standards may combine the tests stated in **9.6.1** and **9.6.2**.

9.6.3 *Test for manhole assemblies*

The test as described in **9.6.1** shall be carried out on jointed vertical sections and bases of manholes.

Joints of vertical sections shall be tested in accordance with **9.6.2** but without tests for angular deflection, shear or diametral deflection.

9.6.4 *Test for inspection chamber assemblies*

Inspection chamber assemblies, designed to be used at depths less than or equal to 2,00 m, shall be tested by filling with water.

The test method, the test period and the test requirements (e.g. water added to maintain the inspection chamber assemblies full) shall be stated in product standards.

Inspection chamber assemblies, designed to be used at depths greater than 2,00 m, shall be tested in accordance with **9.6.3**.

9.6.5 *Test for fittings*

Test methods shall be stated in product standards.

10 Quality control

Product standards shall define sampling and testing regimes including factory production control.

Product standards shall require the manufacturer to establish and maintain an effective documented quality control system which shall be based on the relevant requirements of EN ISO 9002 or EN ISO 9001.

Product standards shall define how certification by third party shall be carried out.

Product standards shall require that, where this is carried out, the third party body comply with the requirements of EN 45011 and/or EN 45012.

11 Marking

Product standards shall specify the marking requirements.

Each component or, where this is not possible, each package of components, shall be marked indelibly and in a clearly visible manner and identification of the component shall be made in such a way that no doubt is possible.

Marking shall include at least the following information:

- European Standard number (product standard number);
- identification of manufacturer and site of production;
- identification of date or period of manufacture;
- identification of third party certification body;
- identification of classes, where applicable;
- identification of use, where applicable.

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Contract requirements

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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