BRITISH STANDARD

BS EN
14457:2004

General requirements for components specifically designed for use in trenchless construction of drains and sewers

The European Standard EN 14457:2004 has the status of a British Standard

ICS 93.030

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British Standards

National foreword

This British Standard is the official English language version of EN 14457:2004.

The UK participation in its preparation was entrusted to Technical Committee B/505, Waste water engineering, 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.

The UK maintained expert participation in the development of this European Standard but recorded opposition to it at both CEN Enquiry and Formal Vote stages, seeing no purpose in its introduction. However, since the standard received the required number of votes from other CEN Members, it was adopted as a European Standard resulting in automatic publication as a British Standard.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 16, an inside back cover and a back cover.

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Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 44159 8

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14457

July 2004

ICS 93.030

English version

General requirements for components specifically designed for use in trenchless construction of drains and sewers

Prescriptions générales pour composants utilisés dans la construction des réseaux d'évacuation et d'assainissement sans tranchée

Allgemeine Anforderungen an Bauteile, die bei grabenlosem Einbau von Abwasserleitungen und -kanälen verwendet werden

This European Standard was approved by CEN on 23 April 2004.

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Ref. No. EN 14457:2004: E

Contents

Foreword

This document (EN 14457:2004) has been prepared by Technical Committee CEN/TC 165 “Wastewater engineering”, the secretariat of which is held by DIN.

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 2005, and conflicting national standards shall be withdrawn at the latest by January 2005.

Annex A is informative.

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1 Scope

This European Standard specifies general requirements for pipes and their joints intended for use in drains and sewers which are installed using trenchless construction methods "pipe jacking", "microtunnelling" and "pilot jacking" as defined in EN 12889 as gravity systems, according to EN 476 where any pressure to occur is a maximum of 40 kPa or operated under pressure according to EN 773 where pressure can be more than 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 and construction techniques.

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

This European Standard applies to components to be used in domestic waste water, rainwater and surface water and other waste waters (e.g. industrial waste water) that will not damage the components.

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 773:1999*, General requirements for components used in hydraulically pressurized discharge pipes, drains and sewers.*

3 Terms and definitions, symbols and abbreviations

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

3.1
external diameter
OD
mean external diameter of the pipe barrel at any cross section

3.2
gravity system
system where flow is caused by the force of gravity and where the pipe usually operates partially full

3.3
hydraulically pressurized system
system where flow is caused by hydraulic pressure and where the pipe usually operates full

3.4
invert
lowest point of the internal surface of the barrel of a pipe or channel at any cross section
[EN 476:1997]

3.5
internal diameter
ID
mean internal diameter of the pipe barrel at any cross section
[EN 476:1997]

3.6
joint
connection between the adjacent ends of two components including the means of sealing and pressure transfer ring, (during installation) if applicable

3.7
nominal size
DN
numerical designation of size of component, which is a convenient integer approximately equal to a manufacturing diameter in millimetres

3.8
pipe barrel
cylindrical part of the pipe with a uniform cross section excluding joint

3.9
pipe length
length of the internal pipe barrel

3.10
ring stiffness
resistance of a pipe to diametric deflection in response to external loading applied along one diametric plane.

For a circular pipe of uniform wall thickness, this is given by:

$$S = \frac{EI}{D_{\mathrm{m}}^3}$$

where

S is the ring stiffness of the pipe in kilonewtons per square metre (kN/m²);

E is the modulus of elasticity in flexure in the circumferential direction in kilonewtons per square metre (kN/m²);

I is the second moment of area of the pipe wall in the longitudinal direction, per unit length, in metres to the fourth power per metre (m^4/m);

D_{m} is the diameter of the neutral axis of the pipe wall, in metres (m)

3.11
surface water
water drained from the surface of buildings, structures or the ground
[EN 476:1997]

3.12
pressure transfer ring
component to transfer longitudinal loads between the end-surfaces of the pipes during the installation

4 Functional and dimensional requirements

4.1 General

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

4.2 Dimensions

4.2.1 Nominal sizes

Nominal sizes, DN, shall be specified in product standards and shall preferably be selected from Table 1.

Other nominal sizes may be specified in product standards.

Table 1 — Nominal sizes DN

150, 200, 225, 250, 300, 400, 500, 600, 800, 1 000, 1 200, 1 400, 1 600, 1 800, 2 000

4.2.2 Diameters

Product standards shall specify at least internal diameters or external diameters.

NOTE It is recommended to consider the external diameter of available jacking machines for the design of pipes.

4.2.3 Tolerances on diameters

4.2.3.1 Tolerances on internal diameter

The maximum admissible tolerances on the internal diameters, ID, are given in Table 2.

Table 2 — Tolerances on internal diameters

Nominal size	Tolerances on mean internal diameter (mm)	Tolerances on individual internal diameter (mm)
150 ≤ DN ≤ 250	± 5	± 10
250 < DN ≤ 600	± 0,02 DN	± 0,04 DN
DN > 600	± 15	± 30

4.2.3.2 Tolerances on external diameter

The admissible tolerances on maximum external diameters are $^{0}_{-10}$ for pipes ≤ DN 300 and $^{0}_{-0,03}$ x DN for larger pipes, but not exceeding $^{0}_{-30}$ mm.

4.2.4 Straightness

For pipes up to 3 m length, the deviation of a surface line from the straight, shall not exceed the values, given in Table 3 (see also 5.2).

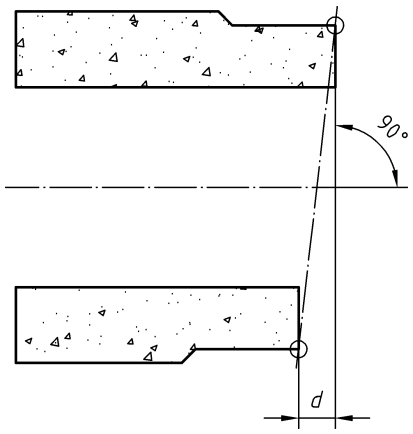
Table 3 — Admissible deviation of straightness

Nominal size	Deviation of straightness (mm)
≤ DN 1 000	5
1 000 < DN ≤ 2 000	10
> DN 2 000	15

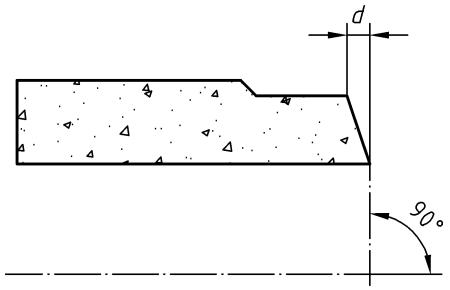
For pipes, longer than 3 m, product standards shall specify the deviation of the surface line from the straight.

4.2.5 Squareness of end faces

Product standards shall specify tolerances on squareness across the external diameter and across the wall thickness of the pipe end faces (see Figure 1).



(a) — Deviation across joint external diameter



(b) — Deviation across joint wall thickness

Figure 1 — Deviation from squareness

NOTE Squareness of ends of pipes is significant only as it relates to the jacking operation and to the performance of the joint assembly.

4.2.6 Pipe length

Product standards shall specify the tolerances for pipe lengths appropriate for the intended installation methods.

4.2.7 Continuity of invert

Joints shall have continuity of invert within the maximum step at joints according to Table 4:

Table 4 — Continuity of invert

Nominal size	Maximum step of invert (mm)
≤ DN 300	6
> DN 300	0,02 x DN no step greater than 30

4.3 Smoothness of bore

Interior surfaces of pipes 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.

4.4 Appearance

Pipes and joints shall be free from defects, which could impair their installation and operation, as well as the durability.

4.5 Joints

Product standards shall specify requirements for joints compatible with intended use. Joints of jacking pipes shall be designed so as to ensure:

— Tightness;

— lateral stability transfer of longitudinal compressive and/or tensile forces.

Product standards shall specify that the manufacturer of pipes maintains specifications of:

— dimensions;

— tolerances;

— materials

of pipe and the joints including the pressure transfer ring, if applicable.

The joints as specified by the pipe manufacturer shall usually be supplied by the manufacturer of the pipes and, if possible, should be pre-installed.

Informative annex A gives examples of joints.

4.6 Corrosion resistance

Pipes and joints shall be resistant to corrosion by wastewater and the effects of soil, ground water and installation effects. Corrosion resistance tests should be specified in product standards.

4.7 Abrasion resistance

Pipes shall be resistant to abrasive effects of hard particles in wastewater. Abrasion resistance tests can be specified in product standards.

4.8 Jetting resistance

Pipes shall be resistant to damage resulting from jetting. Jetting resistance tests can be specified in product standards.

4.9 Modification

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

4.10 Coatings and linings

If coatings, linings or other protective measures are required, it is necessary to specify appropriate indications in product standards, also under consideration of the installation. It may be necessary to specify additional protection for joints.

4.11 Long-term behaviour

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

4.12 Durability

Product standards shall give details of durability characteristics.

4.13 Load bearing capacity

Product standards shall specify the requirements of all characteristics and the related test methods, necessary for structural design under construction and in service, for example:

— minimum crushing strengths;

— minimum ring stiffness values;

— weight per unit volume;

— tensile strength;

— apparent limit of elasticity;

— compressive strength;

— bending strength;

— dynamic load resistance;

— modulus of elasticity.

The pipe manufacturer shall declare the maximum admissible jacking loads depending on the specified angular deflections during installation. The means of evaluation of the jacking load shall be specified in the product standard.

4.14 Tightness

Jacking pipes and joints for gravity systems shall be tight according to:

— an internal water pressure of 50 kPa;

— an external water pressure of 50 kPa.

For hydraulically pressurised systems EN 773:1999, 4.7 shall apply in addition.

Product standards shall specify requirements for resistance to external pressure compatible with intended use.

4.15 Temperature

Jacking pipes and joints shall be suitable for a continuous water discharge temperature of 45 °C for nominal diameters ≤ DN 200, or 35 °C for nominal diameters > DN 200.

Temperature resistance tests can be specified in product standards.

5 Test methods

5.1 General

As far as test methods for the requirements of clause 4 are required, they shall be stated in the product standards.

5.2 Measurement of diameters

5.2.1 Internal diameter of pipe 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.

5.2.2 External diameter of pipe barrels

Where measurement of external diameter is a requirement the product standard shall specify the measurement of the maximum external diameter.

5.3 Measurement of deviation from straightness of pipe barrels

The product standard shall specify the measurement of deviation from straightness and shall state the method of measurement. Deviation shall be measured for not less than the total length of the pipe barrel less any joint profile plus 50 mm for end effects.

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

The product standards shall specify the measurement of deviation from squareness, and the method of measurement shall be stated.

5.5 Continuity of invert

Product standards shall detail the means by which conformity with 4.2.7 shall be demonstrated.

5.6 Water tightness tests

5.6.1 Test for pipes

The water tightness test shall be carried out at ambient temperature, under hydrostatic pressure as stated in 4.14.

Test pieces shall be clamped into a suitable test apparatus and both ends shall be closed tight. They shall be filled with water and vented. They may be preconditioned with water prior testing.

The test method, the test period and the test requirements (e.g. water addition to maintain the test pressure) shall be specified in the product standard.

5.6.2 Test for pipe joints

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 4.14. Where applicable, shear load could be replaced during the test by diametrical deflections.

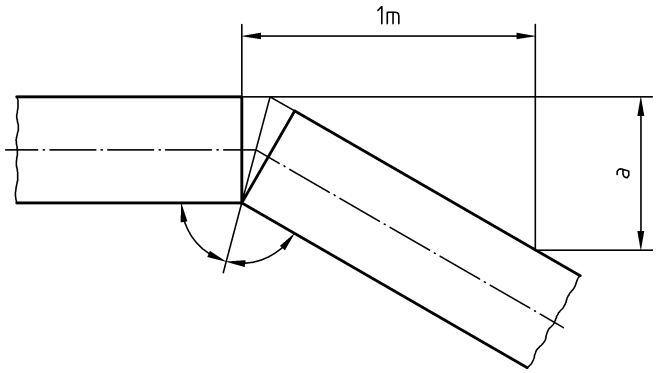
Minimum joint deflection values "a" as illustrated in Figure 2 shall comply with Table 5.

Product standards shall specify test methods for fully assembled joints including pressure transfer ring if applicable.

Table 5 — Minimum angular deflection of pipe joints

Nominal size	Minimum angular joint deflection [a] a (mm/m)
DN ≤ 200	20
200 < DN ≤ 500	15
500 < DN ≤ 1 000	10
DN > 1 000	$10 \times \frac{1000}{DN}$

[a] The joint test specified is a type test and the values are not necessarily those that can be accommodated during the jacking operation.

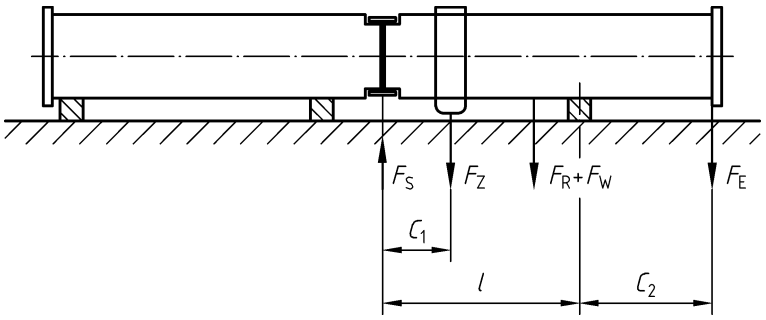


Key

a Minimum angular joint deflection

Figure 2 — Deflection

The minimum shear load values in the joint shall be 20 N x DN.



Key

F_S Shear load in kilonewtons (kN)
C_1 Distance between seal and point where F_Z is applied
l Distance between seal and right hand support
F_Z Additional load
F_R Self weight of pipe
F_W Mass of water
C_2 Distance between right hand support and point where F_E is applied
F_E Self weight of end seal

Figure 3 — Shear load test

F_Z is given by the following equation:

$$F_Z = \frac{1}{l - C_1}\left[F_s \cdot l + F_E \cdot C_2 - \frac{F_R + F_W}{2}(l - C_2)\right]$$

NOTE Product standards may combine the tests stated in 5.6.1 and 5.6.2.

5.7 Air tightness tests

When tightness to air is required by product standards appropriate test methods shall also be stated.

6 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;

— identification of date or period of manufacture;

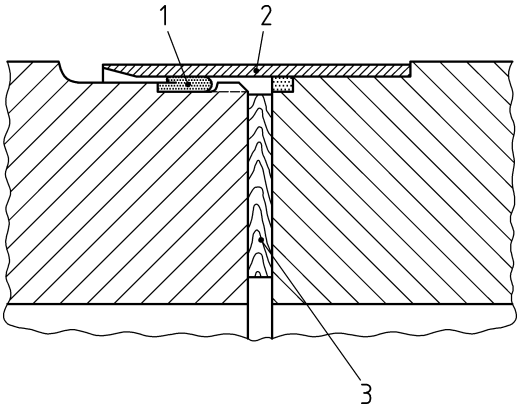
— load bearing resistance (e.g. crushing strength, ring stiffness);

— identification of Jacking strength;

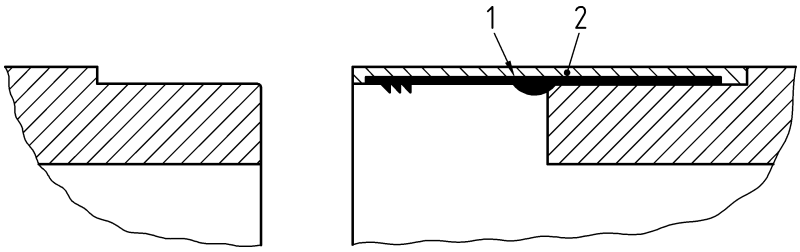
— identification of Third Party Certification Body (if applicable).

Annex A
(informative)

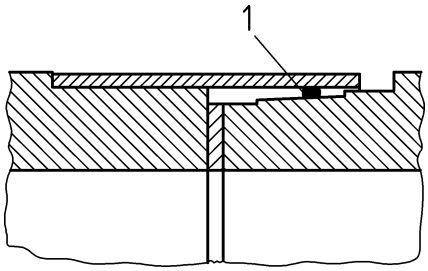
Examples of joints



a) Example 1



b) Example 2



c) Example 3

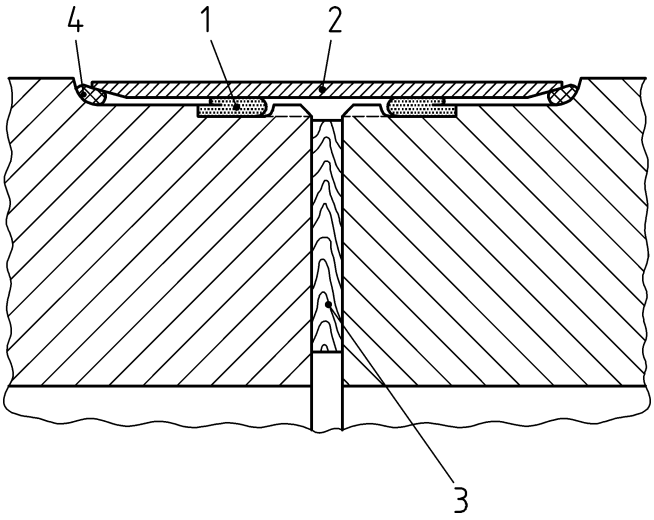
Key

1 Elastomeric seal

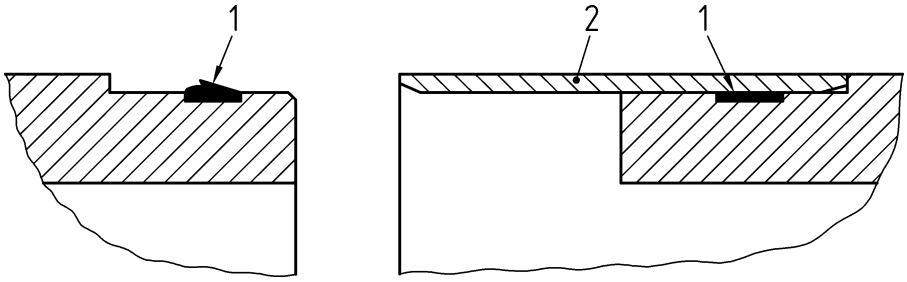
2 Guide ring

3 Pressure transfer ring

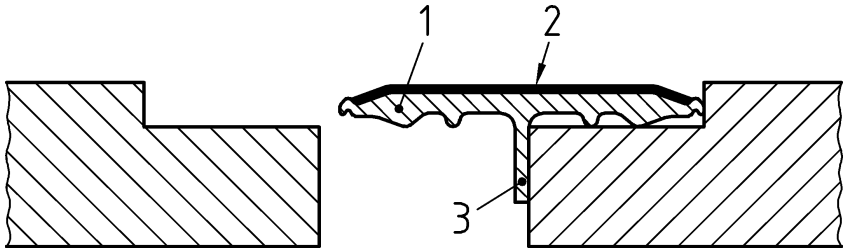
Figure A.1 — Examples of pipe connections with single-sided fixed guide ring



a) Example 1



b) Example 2



c) Example 3

Key

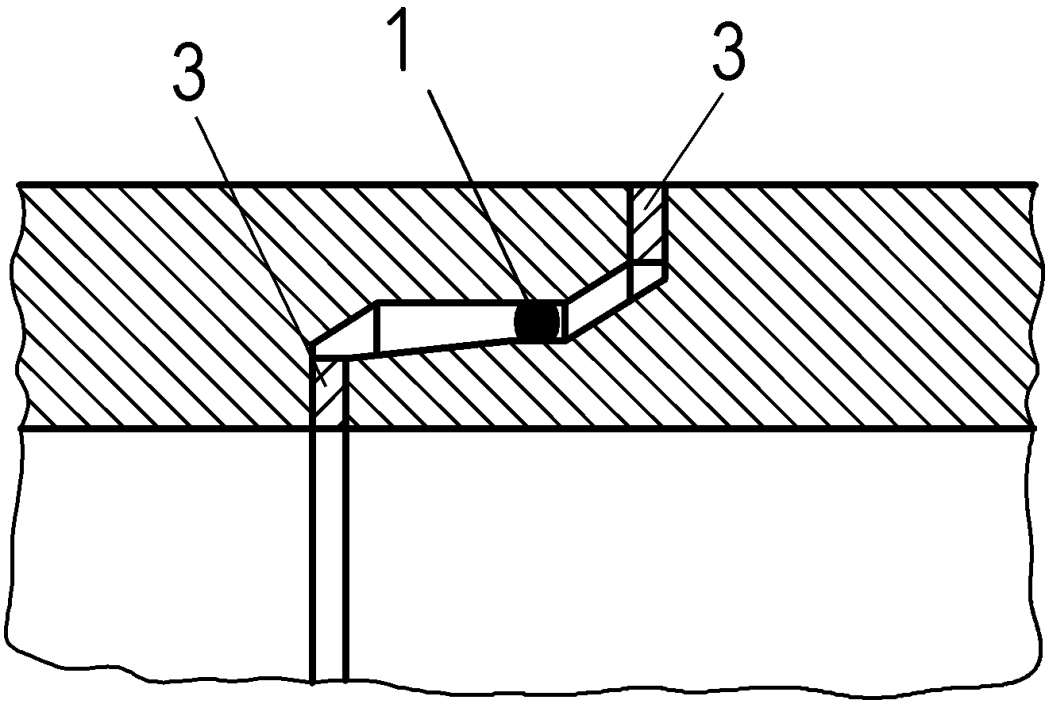
1 Elastomeric seal

2 Guide ring

3 Pressure transfer ring

4 Joint closure with elastomeric ring

Figure A.2 — Examples of pipe connections with loose guide ring



Key

1 Elastomeric seal

3 Pressure transfer ring

Figure A.3 – Example of pipe connection without guide ring

Bibliography

EN 476:1997, *General requirements for components used in discharge pipes, drains and sewers for gravity systems.*

EN 12889:2000, *Trenchless construction and testing of drains and sewers.*

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