BRITISH STANDARD

BS ISO 13267:2010

Thermoplastics piping systems for non-pressure underground drainage and sewerage — Thermoplastics inspection chamber and manhole bases — Test methods for buckling resistance

ICS 23.040.20; 23.040.45; 91.140.80; 93.030

BSI British Standards

National foreword

This British Standard is the UK implementation of ISO 13267:2010.

The UK participation in its preparation was entrusted to Technical Committee PRI/88/1, Plastics piping for non-pressure applications.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Foreword

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Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13267 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 1, *Plastics pipes and fittings for soil, waste and drainage (including land drainage)*.

INTERNATIONAL STANDARD **ISO 13267:2010(E)**

Thermoplastics piping systems for non-pressure underground drainage and sewerage — Thermoplastics inspection chamber and manhole bases — Test methods for buckling resistance

1 Scope

This International Standard specifies methods of test for the resistance of the base of thermoplastics inspection chambers and manholes to external soil and ground-water pressure after installation.

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.

ISO 9967, *Thermoplastics pipes — Determination of creep ratio*

ENV 1046:2001, *Plastics piping and ducting systems — Systems outside building structures for the conveyance of water or sewage — Practices for installation above and below ground*

3 Terms and definitions

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

3.1
inspection chamber
drainage or sewerage fitting used for the to connection of drainage or sewerage installations and for changing the direction of drainage or sewerage runs

NOTE 1 An inspection chamber terminates at ground level, permitting the introduction of cleaning, inspection and test equipment and the removal of debris, but it does not provide access for personnel. The riser shaft connected to these fittings has a minimum outer diameter of 200 mm and a maximum inside diameter of less than 800 mm.

NOTE 2 The termination at ground level permits the introduction of cleaning, inspection and test equipment and the removal of debris but does not provide access for personnel.

3.2
manhole
drainage or sewerage fitting used for the connection of drainage or sewerage installations and for changing the direction of drainage or sewerage runs

NOTE 1 A manhole terminates at ground level, permitting the introduction of cleaning, inspection and test equipment and the removal of debris, and also providing access for personnel. The minimum inside diameter of a manhole riser shaft is 800 mm.

NOTE 2 The termination at ground level permits the introduction of cleaning, inspection and test equipment and the removal of debris and provides access for personnel.

4 Principle

A sealed test assembly, comprising an inspection chamber or manhole base with a minimum height of 300 mm above the top of the main channel, is placed free standing, or buried in a test box on a 100 mm sand or granular bed and covered with granular backfill to a level of minimum 300 mm above the top of the outlets and inlets of the main channel(s). In some cases, the first section of the riser may be required in order to achieve the minimum height of 300 mm.

The assembly is then subjected to a constant internal negative pressure, specified by the product or system standard, for a specified time at a temperature of between 15 °C and 25 °C or as otherwise specified in the product standard.

Alternatively, the pressure difference can be achieved by exposing the test assembly to a constant positive external hydrostatic pressure of the same numeric value as that specified by the product or system standard. The assembly is submerged under water in a closed tank for a specified time at a temperature of between 15 °C and 25 °C or as otherwise specified in the product standard.

During the test, the assembly may be monitored by measuring increasing deflections with time as defined in the product standard.

At the end of the test, the chamber base/manhole is visually checked for cracking or other defects likely to impair the performance of the inspection chamber or manhole.

5 Apparatus

5.1 Test box, large enough to accommodate the test assembly, including the first 300 mm of riser shaft above the top of the outlet and inlets of the main channel, such that at each side there is a free space of 300 mm minimum between the test assembly and the side/top of the test box.

5.2 Backfill material, to cover the test assembly in the box, conforming to ENV 1046:2001, Annex A. Backfill material shall be in accordance with the minimum specification of the manufacturer.

5.3 Sealable water tank or **pressure vessel**, with internal dimensions capable of accommodating the test assembly to ensure all-round clearance and a lockable lid allowing access to the open top of the inspection chamber or manhole. The water tank or pressure vessel shall be such that the test assembly is not able to gain support from the sides or base of the tank or vessel.

It is essential that the removable cover of the tank be designed in such a way that there is a watertight connection between the cover and the open top of the chamber/manhole shaft or base, and that there is an opening big enough for visual inspection inside the chamber or manhole.

The temperature of the water applied shall be (20 ± 2) °C or as otherwise specified in the product standard.

5.4 End closures, to seal any open pipe socket(s), spigot(s) and additionally, the riser shaft. When testing for structural integrity (20 °C), the end closures shall be created using standard pipes with end caps. If testing for durability at higher temperatures, plates welded to the end of the sockets or spigots may used to seal the pipe connections.

5.5 Pressure or **vacuum source**, capable of applying and maintaining the test pressure specified in the product standard specification for the inspection chamber or manhole base as being the maximum pressure that the inspection chamber or manhole base shall be able to withstand (subject to a minimum of –0,02 MPa).

5.6 Pressure measuring devices, capable of measuring the internal negative or external water test pressure to within an accuracy of ±2 %.

5.7 Thermometer, capable of measuring the temperature of the medium surrounding the test assembly to an accuracy of ±0,5 °C.

5.8 Deflection measuring equipment (optional), capable of measuring the deflection of the main channel to within an accuracy of ±0,1 mm. (If required by the product standard.)

5.9 Test assembly, comprising the base and a portion of the riser, if required, to ensure a height of at least 300 mm above the top of the main channel. Unless otherwise specified in the product standard, one test assembly shall be prepared for each test carried out.

NOTE The preferred configuration for testing the inspection chamber/manhole base is the straight through configuration without side entries.

6 Conditioning

Unless otherwise specified in the product standard, the test piece shall be tested no less than 21 days after manufacture and after conditioning in air for at least 6 h at a temperature of between 15 °C and 25 °C.

7 Test environment

Unless otherwise specified in the product standard, testing shall be carried out at a temperature of between 15 °C and 25 °C.

8 Procedure

8.1 Internal negative pressure testing using a free standing test assembly

8.1.1 Seal all inlets and outlets of the test assembly and the top of the riser shaft using the end closures.

NOTE 1 Internal or external tie bars can be used between the inlet and outlet closures to avoid the transmission of external end loading forces to the inspection chamber/manhole base via the end closures.

NOTE 2 The test assembly can be turned 180° upside down to simplify the test.

If the base is designed with a double wall, where the outer wall is designed to withstand upthrust, one or more 3 mm to 4 mm diameter holes shall be drilled through the inner wall to ensure that the internal negative pressure is loaded against the outside wall of the base assembly.

8.1.2 If the measurement of deflection is required by the product standard install the two devices for measuring deflection at points W and H, as shown in Figures 1 and 2.

In the case where bases are non-spherical, the relative vertical deformation of the base can be measured directly from a datum provided by a stiff beam connected at points H_L and H_R.

If a separate datum is used, the points H_L, H_R and H_M shall be measured from that datum during the test and the final deflection, expressed as Y_V, which is given by Equation (1):

$$Y_V = [(H_L + H_R)/2] - H_M \quad (1)$$

The change of the width of the main channel shall be expressed as Y_H, where this is the change to dimension W.

The sample shall be visibly inspected for evidence of cracks after completion of the test.

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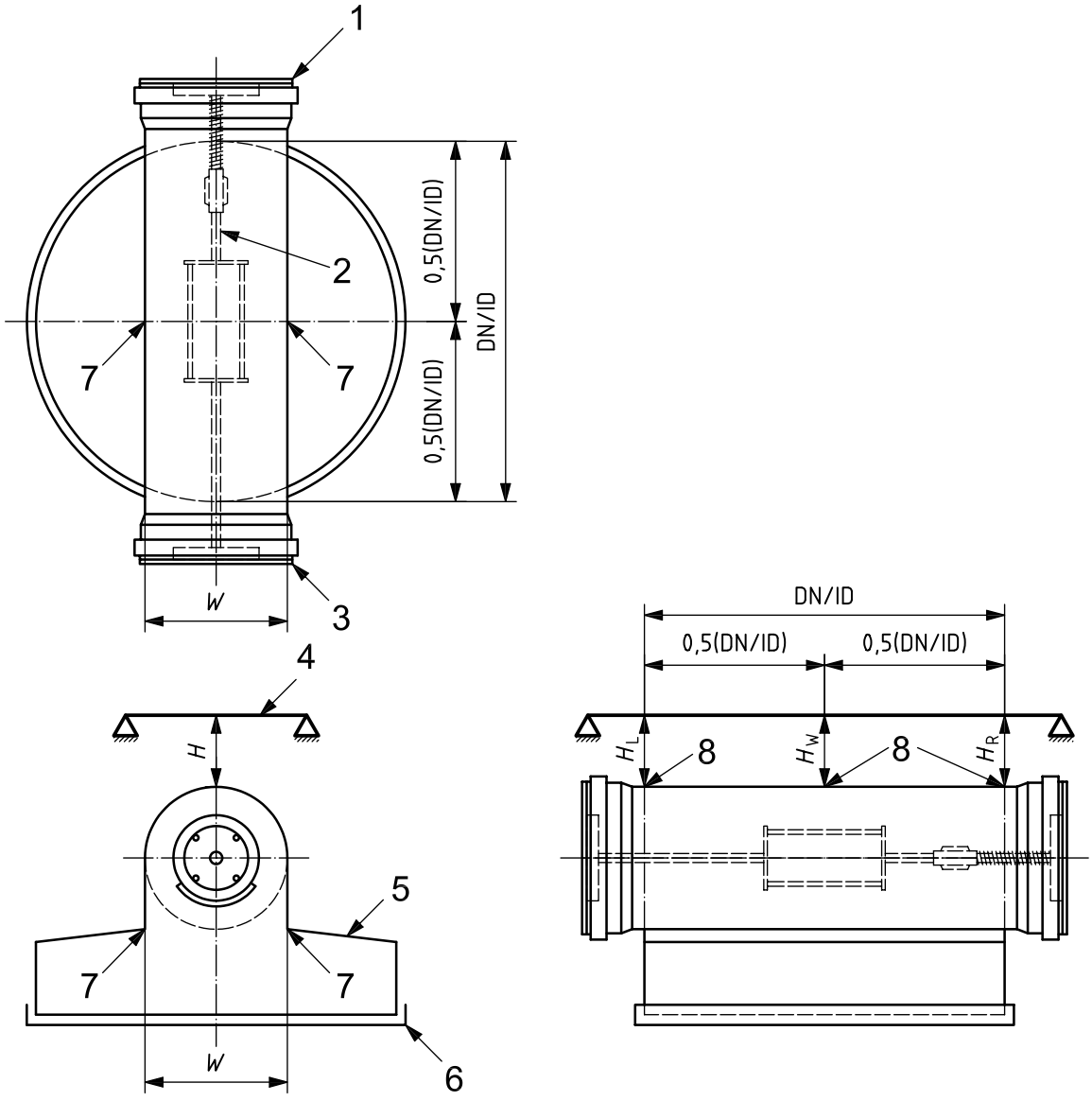
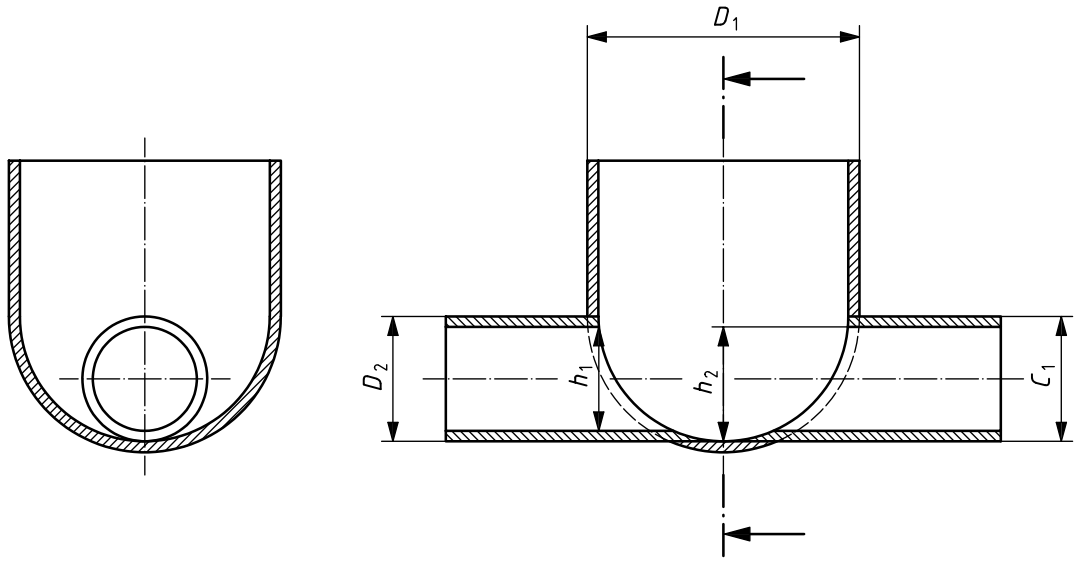


Key

1 plug-inlet
2 plug support device
3 plug-outlet
4 reference
5 base section
6 removable cover
7 measuring point for dimension W
8 measuring point for dimension H

Figure 1 — Position of measuring devices in the main



Key

C_1 diameter of connection 1

D_1 chamber diameter

D_2 outlet connection diameter

h_1 measure height at point 1, which points are located at inlet and outlet

h_2 measure height at point at the middle of the base

Figure 2 — Position of measuring devices for spherical bases

8.1.3 Connect the pressure source and pressure-measuring device to the test assembly and apply the internal negative pressure (see 5.5), maintaining it at between 15 °C to 25 °C or at the temperature specified in the product standard for a minimum of 1 000 h or for the time specified in the referring standard for the inspection chamber or manhole base within a tolerance of ±2 %. If deflection measurements are required by the product standard, these shall be taken at the required defined intervals throughout the test.

8.2 Internal negative pressure testing using a test box

Prepare the test assembly as described in 8.1.1. Place the test assembly on a (100 ± 10) mm thick granular bed, in the position in which it would be installed, see Figure 3. Apply the backfill and compact to the minimum specified in the manufacturer's documentation (see 5.2). Connect and apply the test pressure as described in 8.1.3.

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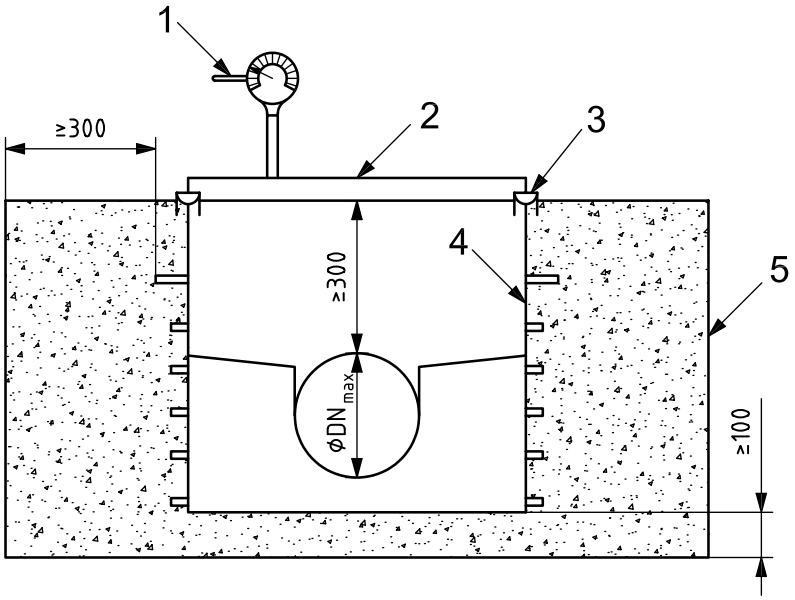
Dimensions in millimetres



Key

1 vacuum source
2 cover
3 seal
4 base-component
5 tank/test box

Figure 3 — Test set-up when testing in a test box

8.3 External pressure testing with the assembly submerged in a water tank

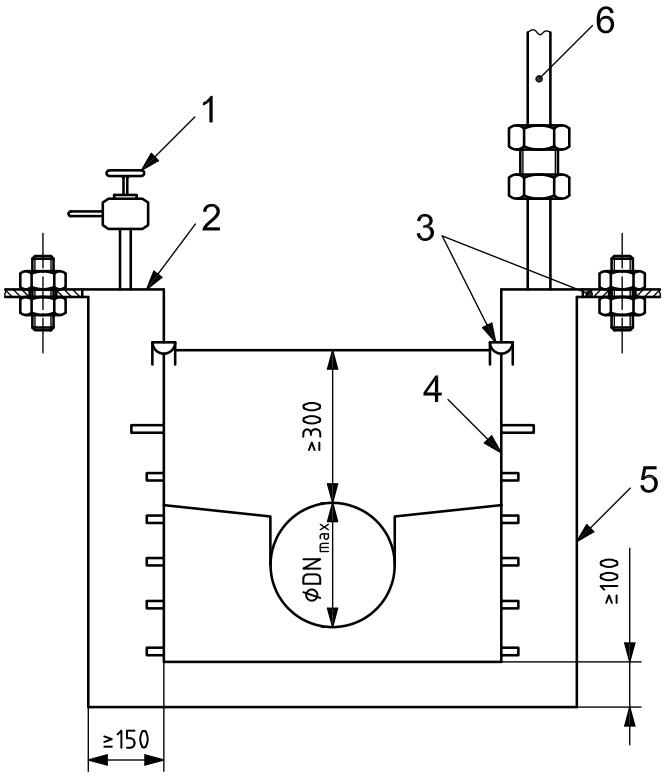
Prepare the test assembly as described in 8.1.1.

It is permitted to cut back the riser shaft to a height of 300 mm above the top of the outlets and inlets of the main channel(s).

Place the assembly in the water tank and fill the annular space between tank and assembly with water. Lock the lid of the tank in position leaving access to the open top of the inspection chamber or manhole (see Figure 4).

Connect a pressure source and pressure-measuring device to the tank, apply the external test pressure (see 5.5) and maintain the pressure for the duration of the test, within a tolerance of ±2 %.

Dimensions in millimetres



Key

1 vent valve
2 cover
3 seal
4 base-component
5 tank
6 water hose

Figure 4 — Test set-up of testing in a pressure vessel

8.4 Evaluation

At the end of the test, observe the test assembly for any signs of cracking.

If extrapolation of the deflection data is required by the product standard, this shall be carried out by the method of least mean squares as generally described in ISO 9967 to 50 year time period as required, unless otherwise specified in the referring product standard.

NOTE Annex A shows an example of evaluation using the method of least mean squares.

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9 Test report

The test report shall include the following information:

a) reference to this International Standard, i.e. ISO 13267:2010, and the referring standard for the inspection chamber or manhole base;

b) identification of the inspection chamber or manhole, including the nominal size(s) of the main channel(s);

c) test procedure used and the soil type used, if testing with the test box;

d) test pressure applied;

e) test temperature;

f) test duration time;

g) if required by the referring standard, deflections generated at the end of the test or the predicted 50 year deflections as specified;

h) visible crack(s);

i) any factor noted during the test procedure that could have affected the test result, such as any incident or operating detail not covered in this International Standard;

j) date of the test.

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Annex A
(informative)

Evaluation example

Table A.1 — Evaluation example

Interval	**Time** h	$x = \lg t$	**Deformation** mm	**Dataset**	**Trendline** $y = ax + b$	R	1 000 h **prediction** mm
t_1	0,1	–1	0,83	t_1 to t_{11}	$y = 0{,}575\ 3x + 1{,}099\ 5$	0,967 4	2,83
t_2	1	0	1,08	t_2 to t_{11}	$y = 0{,}667\ 7x + 0{,}875$	0,974 7	2,88
t_3	4	0,602 1	1,27	t_3 to t_{11}	$y = 0{,}756\ 9x + 0{,}644\ 1$	0,976 4	2,92
t_4	24	1,380 2	1,58	t_4 to t_{11}	$y = 0{,}923\ 5x + 0{,}198\ 2$	0,981 9	2,97
t_5	168	2,225 3	2,09	t_5 to t_{11}	$y = 1{,}258\ 1x - 0{,}726\ 1$	0,998 4	3,05
t_6	336	2,526 3	2,45	t_6 to t_{11}	$y = 1{,}322\ 3x - 0{,}908\ 4$	0,997 7	3,06
t_7	504	2,702 4	2,65	t_7 to t_{11}	$y = 1{,}422\ 8x - 1{,}198\ 8$	0,999	3,07
t_8	600	2,778 2	2,75	—	—	—	—
t_9	696	2,842 6	2,84	—	—	—	—
t_{10}	864	2,936 5	2,99	—	—	—	—
t_{11}	1 008	3,003 5	3,07	—	—	—	—

The trendline ($y = 1{,}422\ 8x - 1{,}198\ 8$) shows the best prediction for the 1 000 h value and hence used for the prediction of the deformation after 50 years. If extended testing is required to generate an R correlation > 0,9, then the additional testing intervals beyond 1 000 h shall be as those specified in ISO 9967:2007, 8.3.

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