BRITISH STANDARD

BS 7158:2001

# Plastics inspection chambers for drains and sewers — Specification

ICS 91.140.80

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee, PRI/88 Plastic piping systems, to Subcommittee PRI/88/1 Thermoplastics piping systems and components for non-pressure applications, upon which the following bodies were represented:

Institute of Building Control
Institute of Plumbing
Land Drainage Contractors Association
National Association of Plumbing and Heating
Plastics Land Drainage Manufacturing Association
Department of the Environment, Transport and the Regions
British Adhesives and Sealants Association
Papers Department of the Environment for Northern Ireland
Health and Safety Executive
Chartered Institute of Water and Environment
The Scottish Office
British Plastics Federation

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# Contents

# Foreword

This British Standard has been prepared by sub-committee PRI/88/1, Thermoplastics piping systems and components for non-pressure applications. It is a revision of BS 7158:1989, which is now withdrawn.

It comprises a specification for inspection chambers made of specified plastics materials and is intended for use in the construction of drains based on rigid pipes and/or flexible pipes in accordance with BS EN 752.

Annex A to Annex G are normative and give methods of test.

Annex H is informative and gives guidance on the use and installation of plastics inspection chambers.

Annex I is normative and introduces a method of test for resistance to negative pressure (for inspection chambers deep).

Annex J is informative and gives guidance on quality control for the manufacture of plastics inspection chambers.

Attention is drawn to BS 5955-6, which gives guidance on the installation, testing, cleaning and repair of unplasticized PVC pipework for gravity drains and sewers.

Attention is drawn to BS 4346-3 and to BS 6209, which include requirements for cements suitable for jointing PVC-U pipes for non-pressure applications and are applicable to pipework systems conforming to BS EN 1401-1.

It has been assumed in the preparation of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced personnel.

This revision of the first edition of BS 7158 introduces the following principal changes.

a) In clause **4**, the materials allowed have been extended to include recycled material, as defined by BS ISO 472:1988, but controlled by adding an item f) to **4.2** with requirements similar to those which apply to reprocessed material, i.e. the material shall be a PE, PP or PVC-U traceable to a single source of known origin. The definitions for reworked and recycled materials have been updated to align with the current edition of BS ISO 472.

b) In clause **6**, the choice of colour is now unrestricted, i.e. no longer confined to only brown or black.

c) Subclause **7.8** and Annex I introduce additional requirements for inspection chambers deep, incorporated from prEN 13598-1.

d) In clause **8**, the marking requirements have been modified with two objectives in mind:

1) to eliminate the need for all components of an assembly, e.g. riser and frame and cover, to each carry all the markings;

2) to eliminate the final sentence of item f) which was subjective and not considered essential for relatively shallow chambers.

e) References are updated to cater for withdrawn British Standards and/or the introduction of relevant BS ENs.

*Product certification/inspection/testing.* Users of this British Standard are advised to consider the desirability of third party certification/inspection/testing of product conformity to this British Standard. Appropriate conformity attestation arrangements are described in BS EN 45011. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

Attention is drawn to the provisions of the Health and Safety at Work etc. Act 1974 and the need to ensure that appropriate precautions are taken to ensure the safety of personnel when carrying out methods of test required by this standard.

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.

**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, pages i and ii, pages 1 to 21 and a back cover.

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## Introduction

The publication of this British Standard as an individual standard is intended to avoid duplication of specification and confusion of marking of plastics inspection chambers used in drainage systems otherwise made of different materials which may or may not be plastics.

The chambers can be designed for use with one or more different systems made in accordance with other standards. Provision is made for marking integral connections on the chambers to indicate the system components and sizes, in accordance with other standards with which the connection is dimensioned, to allow direct connection as applicable. At least two of the systems with which such chambers are expected to be used, namely those specified in BS EN 295-1 and BS EN 1401-1, embody fundamentally different philosophies in respect of sampling requirements and inspection systems. Attention is drawn to Annex J and to the advice concerning certification.

Since BS 8301 is now obsolescent, attention is drawn to parts 1 to 7 of BS EN 752, which give recommendations for the design, construction and use of drainage systems, including inspection chambers, under and around buildings and their connections to downstream systems. Attention is drawn also to BS EN 1610, which gives general requirements for testing of drains, including inspection chambers.

This revision has been prepared taking into account the National Annex to BS EN 752-3:1997 which defines UK national installation practice for underground drainage products. The 2000 version of that National Annex makes provision for the first time in the UK for having deep non-man-entry inspection chambers. This change was made to enhance the safety aspects of deep access by relying on more modern surface-based techniques. Attention is drawn to *Safe work in confined spaces* [1], which encourages the use of non-man-entry inspection systems.

The additional testing requirements added to this revision of BS 7158 allow chambers to be used at depths down to 6 m.

## 1 Scope

This British Standard specifies requirements for plastics inspection chambers for use at depths to invert not exceeding 6 m in the construction of drainage and sewerage systems.

It is applicable to non-man-entry chambers with or without raising pieces and having a nominal cross-section as recommended in Table NB.2 of BS EN 752-3:1997, as amended in 2000.

The chambers are classified into four grades as a function of stiffness (see **7.6**) and strength (see **7.7**), to suit different depths of installation and location for exposure to surface loading (see Annex H). Attention is drawn to BS EN 124:1994 and BS 4660 which specify requirements for covers and frames for drainage purposes that are applicable to inspection chambers.

This standard specifies materials, dimensions and tolerances, physical and performance characteristics and marking for plastics inspection chambers for drains and sewers.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 903-A26, *Physical testing of rubber — Method for determination of hardness (hardness between 10 IRHD and 100 IRHD).*

BS 2782-11:Method 1103V, *Plastics piping and ducting systems — Thermoplastics pipes and fittings — Part 11: Determination of Vicat softening temperature (VST).*

BS 3396-1, *Woven glass fibre fabrics for plastics reinforcement — Part 1: Specification for loom-state fabrics.*

BS 3396-2, *Woven glass fibre fabrics for plastics reinforcement — Part 2: Specification for desized fabrics.*

BS 3396-3, *Woven glass fibre fabrics for plastics reinforcement — Part 3: Specification for finished fabrics for use with polyester resin systems.*

BS 3412, *Methods of specifying general purpose polyethylene materials for moulding and extrusion.*

BS 3447:1962, *Glossary of terms used in the glass industry.*

BS 3496, *Specification for E glass fibre chopped strand mat for the reinforcement of polyester resin and other liquid laminating systems.*

BS 3532, *Method of specifying unsaturated polyester resin systems.*

BS 3691, *Specification for E glass fibre rovings for the reinforcement of polyester and epoxy resin systems.*

BS 3749, *Specification for E glass fibre woven roving fabrics for the reinforcement of polyester and epoxy resin systems.*

BS 5139:1991, *Method of specifying general purpose polypropylene and propylene copolymer materials for moulding and extrusion.*

BS ISO 472:1988, *Plastics — Vocabulary.*

BS EN 124:1994, *Gully tops and manhole tops for vehicular and pedestrian areas — Design requirements, type testing, marking, quality control.*

BS EN 681-1, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber.*

BS EN 681-2, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 2: Thermoplastic elastomers.*

BS EN 752-3:1997 (including amendments No. 1 and No. 2), *Drain and sewer systems outside buildings — Part 3: Planning.*

BS EN 1295-1, *Structural design of buried pipelines under various conditions of loading — Part 1: General requirements.*

BS EN 1401-1, *Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly(vinyl chloride) (PVC-U) — Part 1: Specifications for pipes, fittings and the system.*

GREAT BRITAIN. Great Britain Highways Agency. *Manual of contract documents for highway works — Vol. 1 Specification for highway works.* ISBN 0 115 51979 3. London: TSO, 1998.

GREAT BRITAIN. Great Britain Department of Transport. *Specification for the reinstatement of openings in highways — A code of practice.* ISBN 0 115 51143 1. London: TSO, 1992.

## 3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS ISO 472:1988 and BS 3447:1962 and the following apply.

**3.1**
**C-glass**
alkali calcium glass with an enhanced boron trioxide content and intended for applications requiring enhanced chemical resistance accordingly

NOTE This definition is consistent with ISO 2078:1985 and equivalent to the definition given in DIN 1259-1:1986.

**3.2**
**inspection chamber**
chamber with a removable cover constructed on a drain or sewer that provides access from surface level only, but does not permit entry of a person

NOTE Term reproduced from BS EN 752-1:1996.

**3.3**
**inspection chamber deep**
inspection chamber, constructed on a drain or sewer at unrestricted depth, that provides access for inspection and maintenance by remotely operated equipment with minimum size of access to prevent personnel entry and a depth to invert not exceeding 6 m

**3.4**
**inspection chamber shallow**
inspection chamber, constructed on a drain or sewer and with a removable cover, that provides access for inspection, testing, maintenance, clearance of obstructions and removal of debris, all when operating from surface level with a depth to invert not exceeding 1.2 m

**3.5**
**recycled plastic**
plastic derived from discarded articles which have been cleaned and ground

NOTE 1 Recycled plastics can be reformulated by the addition of e.g. fillers, plasticizers, stabilizers and pigments.

NOTE 2 Term reproduced from BS ISO 472:1988.

**3.6**
**reprocessed plastic**
thermoplastic prepared from scrap industrial plastic by other than the original processor

NOTE 1 Reprocessed plastics may or may not be reformulated by the addition of e.g. fillers, plasticizers, stabilizers, and pigments.

NOTE 2 Term reproduced from BS ISO 472:1988.

**3.7**
**reworked plastic**
thermoplastic prepared from trimmings or rejected mouldings that has been reprocessed in a fabricator's plant after having been previously processed in that plant

NOTE 1 Term reproduced from BS ISO 472:1988.

NOTE 2 Examples of processing are moulding and extrusion.

**3.8**
**visible cracking**
presence of cracks apparent under close inspection by eye without magnification

## 4 Materials

### 4.1 General

The material from which the main body of the inspection chamber and/or the raising piece is produced shall comprise a thermoplastics material in accordance with **4.2** or a reinforced thermosetting resin in accordance with **4.3**, based on the corresponding monomers or polymers as applicable. The material shall incorporate other ingredients or reinforcement as necessary for the manufacture of an inspection chamber and/or raising piece in accordance with the other requirements of this standard as applicable (e.g. pigments or dyes to satisfy the requirements of clause **6**).

Elastomeric joint rings used in drainage and sewerage connections to and from inspection chambers, for the connection of chamber bases to raising pieces and for fabrication on site, shall satisfy the requirements for rings of vulcanized rubber given in BS EN 681-1 or thermoplastic elastomers given in BS EN 681-2.

NOTE Seals of cellular vulcanized rubber conforming to BS EN 681-3 or cast polyurethane conforming to BS EN 681-4 may be used for the connection of chamber bases to raising pieces or the connection of raising pieces to raising pieces.

### 4.2 Thermoplastics materials

The thermoplastics material shall be selected from the following.

a) Polyethylene (PE) plastic[1)], to be specified in accordance with BS 3412 together with the designation applicable to the method of processing to be used for the manufacture of the inspection chamber or raising piece and otherwise as necessary to satisfy **4.1** of this standard.

b) Polypropylene (PP) plastic[1)] or propylene plastic[1)], to be specified in accordance with BS 5139:1991 as light- and weather-stabilized together with the designation applicable to the method of processing to be used for the manufacture of the inspection chamber or raising piece and otherwise as necessary to satisfy **4.1** of this standard.

c) Unplasticized polyvinyl chloride (PVC-U) plastic[1)] which, when tested in accordance with BS 2782-11: Method 1103V, shall have a Vicat softening temperature of not less than 79 °C for test pieces taken from an inspection chamber or raising piece and shall otherwise be specified as that necessary to satisfy **4.1** of this standard.

[1)] Term defined in BS ISO 472:1988.

d) Reworked plastic (see **3.7**). If reworked material is added or used it shall be clean, derived under the control of the manufacturer of the inspection chamber or raising piece and, if applicable, of the same type and compatible with the material in accordance with items a), b), c), e) and/or f) of **4.2** to which it is added.

e) Reprocessed plastic (see **3.6**). The use of reprocessed material shall be permissible providing the material is clean, free from inclusions and otherwise as specified in accordance with items a), b) or c) of **4.2**. The material shall be traceable to a single source of known origin. If blended with material in accordance with items a), b) or c) of **4.2**, it shall be of the same type and be compatible therewith.

f) Recycled plastic (see **3.5**). The use of recycled material shall be permissible providing the material is clean, free from inclusions and otherwise in accordance with items a), b) or c) of **4.2**. The material shall be traceable to a single source of known origin. If blended with material conforming to items a), b) or c) of **4.2**, it shall be of the same type and compatible therewith.

### 4.3 Thermosetting materials

The thermosetting materials shall comprise a reinforced plastic[1)] incorporating resin and reinforcement in accordance with items a) and b) of the following list and optionally materials in accordance with one or more of the remainder of the list.

a) Resin. The resin system used shall conform to BS 3532 for polyesters or shall be based on an epoxy resin[1)];

b) Reinforcement. Except for alternative surface tissues [see c)], all reinforcement shall be derived from continuously drawn filaments of E-glass [1146[2)], (see note)] and used in the following forms alone or in any combination subject to compatibility with the resin system used:

1) chopped strand mat in accordance with BS 3496;

2) woven fabric in accordance with BS 3396-1, BS 3396-2 or BS 3396-3 as applicable;

3) woven fabric in accordance with BS 3749;

4) rovings in accordance with BS 3691;

5) individual filaments and/or strands, chopped or continuous, having a minimum diameter of not less than 0.005 mm and having a surface treatment compatible with the resin used in accordance with **4.3**a) of this standard.

NOTE Such glass includes either alumino-borosilicate glass or alumino-calco-silicate glass, in either case optionally containing other oxides, especially aluminium trioxide, incorporated for enhanced corrosion resistance and then sometimes described as E.CR glass.

c) Surface tissues, comprising tissues optionally incorporated into the superficial layers of the internal and/or external surfaces of the reinforced plastics article. These tissues shall be made from glass materials in accordance with item b) of **4.3** or otherwise of C-glass (see **3.1**) or from woven or non-woven textiles based on polyester or acrylic fibres;

d) Aggregates, in the particle size range 0.05 mm to 0.5 mm, such as graded silica sands, incorporated where they are a designed part of the composite structure;

e) Fillers, comprising fine material with a particle size below 0.05 mm, incorporated either on their own or with aggregates;

f) Additives, incorporated for modifying the properties of the resin, e.g. for viscosity control.

[2)] Term defined in BS 3447:1962.

## 5 Dimensions

### 5.1 General

The general form of the inspection chamber and associated benching and channels shall be in accordance with the recommendations given in NB 4.1, NB 4.2 and NB 4.5 plus Table NB.2 of BS EN 752-3:1997.

### 5.2 Horizontal cross-sections

#### 5.2.1 *Circular chambers*

Inspection chambers shallow having a maximum depth to invert 0.6 m and intended for drains or sewers not exceeding DN/ID 150 shall have a minimum nominal internal diameter of 190 mm.

Inspection chambers shallow having a maximum depth of invert 1.2 m and inspection chambers deep shall have a minimum internal diameter of 450 mm.

For inspection chambers deep, the upper part of the chamber shall reduce to a maximum shaft size of 300 mm × 300 mm or 350 mm diameter to form a neck entry.

#### 5.2.2 *Rectangular chambers*

Inspection chambers shallow and inspection chambers deep shall have minimum nominal internal dimensions of 450 mm × 450 mm. The upper part of an inspection chamber deep shall reduce to a maximum shaft size of 300 mm × 300 mm or 350 mm diameter to form a neck entry.

#### 5.2.3 *Tolerances*

The permissible deviations from the manufacturer's stated internal dimensions shall be ±2 %.

NOTE These permissible deviations are set to accommodate variations in design and are not intended to ensure that riser sections from different designs or manufacturers are interchangeable.

### 5.3 Telescopic joints

When provided with a telescopic joint, the joint shall be designed to prevent projection into the chamber.

NOTE This is intended to avoid snagging during removal of CCCT inspection equipment.

## 6 Appearance

For an inspection chamber or raising piece made of thermoplastics material, the surfaces shall be free from visible cracking and visible inclusions.

For an inspection chamber or raising piece made of glass reinforced plastics, the interior shall have a continuous smooth internal surface. The exterior surface shall be free from sharp projections. Both inner and exterior surfaces shall be clean and free from protruding fibres and from voids, pits, bubbles, cracks, blisters or foreign matter that would prevent conformity to clause **7**.

## 7 Performance requirements

### 7.1 General

Inspection chambers shall conform to **7.2** to **7.8** using components assembled in accordance with the manufacturer's instructions.

Where a manufacturer supplies chamber raising pieces, performance tests shall be carried out on a combination of the chamber and raising piece(s) to yield an invert depth representing the maximum depth nominated by the manufacturer.

### 7.2 Watertightness

When tested in accordance with Annex A for a period of 5 min, there shall be no visible leakage from the joints or the body of the components.

### 7.3 Resistance to angular deflection

When tested in accordance with Annex B for a period of 5 min, the pipe connections shall not exhibit any visible leakage.

### 7.4 Diametric distortion or shear resistance

#### 7.4.1 *Applicability of test*

Pipe or fitting connections shall conform to **7.4.2** or **7.4.3** as applicable depending upon whether the system to which connection is intended is classified as rigid or flexible in accordance with BS EN 1295-1:1998, NA.1.

NOTE For connection to a pipe or fitting conforming to BS EN 1401-1 or BS 4660, **7.4.2** would apply or for connection to a pipe or fitting conforming to BS 65 or BS EN 295-1,**7.4.3** would apply.

#### 7.4.2 *Resistance to diametric distortion*

Pipe or fitting connections, intended for use with flexible pipes and fittings, shall show no visible signs of leakage when tested in accordance with Annex C for a period of 5 min.

#### 7.4.3 *Resistance to shear*

Pipe or fitting connections intended for use with rigid pipes and fittings shall show no visible cracking (see **3.8**) or signs of leakage when tested in accordance with Annex D for a period of 5 min.

### 7.5 Resistance to elevated temperature cycling for inspection chambers shallow

When tested in accordance with Annex E, the joints under test shall show no visible signs of leakage. On completion, the inspection chamber shall not exhibit any visible cracking and shall withstand an internal water test in accordance with method A of Annex A for 5 min without visible leakage.

### 7.6 Specific tangential initial stiffness (STIS) of riser

When tested in accordance with Annex F, the test piece shall not exhibit any visible cracking (see **3.8**) and the mean specific tangential initial stiffness shall be not less than the applicable value given in Table 1.

**Table 1 — Classification of specific tangential initial stiffness (STIS)**

| Inspection chamber | Minimum specific tangential initial stiffness kN/m² |
|---|---|
| Shallow | 0.7 |
| Deep | 2.0 |

### 7.7 Resistance to vertical loading

When tested in accordance with Annex G, inspection chamber assemblies shall be classified by loading strength into the following classes: A15, B125, C250, D400 (see Annex H).

Class A15 and B125 inspection chambers shall not exhibit a change in their horizontal dimensions of more than 6 % at any point nor exhibit any visible cracking when inspected after removal of the test load and cover but whilst still surrounded by the gravel.

Class C250 and D400 inspection chambers shall not exhibit:

a) a change of level between the frame and roadway of more than 6 mm from a point on the roadway 250 mm adjacent to the frame;

b) any visible cracking when inspected after removal of the test load and cover but whilst still surrounded by the gravel.

### 7.8 Resistance to negative pressure

When tested in accordance with Annex I, the inspection chamber deep shall not:

a) deform at the initial reference mid-point by more than 0.02 × DN/ID of outlet or 5 mm, whichever is the larger;

b) exhibit a vacuum loss of greater than 0.1 × the initial test pressure, 15 min after removal of the negative pressure source.

c) exhibit any damage that could be deemed to impair its function.

## 8 Marking

Each chamber component or assembly of components shall be indelibly marked with the following:

a) manufacturer's identification;

b) the number and date of this British Standard, e.g. BS 7158:2001[3)];

c) the nominal horizontal dimensions (see **5.2**);

d) loading classification grade of A15, B125, C250 or D400 as applicable;

e) the applicable symbol for the type of plastics material as follows:

1) PE for polyethylene;

2) PP for polypropylene and propylene plastics;

3) PVC-U for unplasticized poly(vinyl chloride);

4) GRP for glass-reinforced thermosetting plastics and/or a symbol to indicate the resin system as follows:

i) EP for epoxy resin;

ii) UP for polyester resin;

f) the pipe/fitting/joint system(s) for which the individual integral inspection chamber inlet and/or outlet connections are compatible. If all the connections are compatible with one or more specific system specification(s), one marking to identify the system(s) shall be considered sufficient, otherwise the individual connections shall each be marked;

g) whether or not the chamber has to be used with a telescopic joint.

[3)] Marking BS 7158:2001 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

# Annex A (normative)
# Methods of test for watertightness (for inspection chambers shallow)

## A.1 Apparatus

**A.1.1** *Watertight seals and/or plugs*, to suit open connections or ends on each inlet and outlet on the inspection chamber or pipes or fittings connected thereto.

**A.1.2** *Vessel or jacket suitable for containing water*, surrounding the test assembly in accordance with **A.2** and **A.3.2**.

## A.2 Test assembly

The test assembly shall comprise an inspection chamber assembled in accordance with the manufacturer's instructions together with watertight seals and plugs (**A.1.1**) secured to suit each inlet and outlet of the assembly except for the top of the inspection chamber or, if applicable, raising piece or pieces.

## A.3 Procedure

### A.3.1 *Method A: Method of test for leakage when containing water*

Position the test assembly with the axis of the inspection chamber vertical and fill it with water to within 25 mm of the top of the test assembly. After the specified interval, inspect the test assembly externally for visible signs of leakage.

### A.3.2 *Method B: Method of test for leakage when surrounded by water*

Position the test assembly with the axis of the inspection chamber vertical within the vessel or jacket (**A.1.2**) and fill the latter with water whilst preventing flotation of the test assembly until the chamber is surrounded with water to within 25 mm of its top. After the specified interval, inspect the test assembly internally for visible signs of leakage.

## A.4 Test report

The report shall include:

a) the identification of the components of the test assembly;

b) a reference to this method of test;

c) a report of whether or not leakage was observed when tested in accordance with method A and/or method B as applicable;

d) the date of test.

# Annex B (normative)
# Method of test for resistance to angular deflection

## B.1 Apparatus

**B.1.1** *Equipment capable of axially deflecting an assembled pipe joint*, either by supporting the inspection chamber and loading the ends of the pipe or by supporting the ends of the pipe and loading the inspection chamber. The equipment shall be capable of permitting the application of a test for leaktightness in accordance with method A of Annex A. The connecting pipes shall be held in the socket of the chamber against the end thrust due to test pressure. The equipment shall not otherwise support the joint against the internal test pressure.

## B.2 Test assembly

The test assembly shall comprise an inspection chamber assembled in accordance with the manufacturer's instructions together with one or more inlet or outlet pipes as applicable to each design of socket of the chamber to be tested.

### B.3 Procedure

Apply a deflecting force to the joint assembly so as to cause an angular deflection between the axes of the jointed components. The angular deflection shall be not less than 3° for joints corresponding to a nominal pipe internal diameter of not greater than 200 mm, or a nominal pipe size not greater than (DN) 200 (metric series), depending upon the pipe system for which the joint is intended, or not less than 1½° for joints having a greater nominal pipe internal diameter or size. Fill the test assembly with water to within 25 mm of the top of the chamber. After the specified interval, inspect the test assembly externally for visible signs of leakage in respect of the joint or joints under test.

### B.4 Test report

The test report shall include:

a) the identification of the components of the test assembly;

b) a reference to this method of test;

c) a report of whether or not leakage was observed in respect of each of the joints under test;

d) the date of the test.

## Annex C (normative)
## Method of test for resistance to diametric distortion of chamber joint assemblies with flexible pipe systems

### C.1 Apparatus

**C.1.1** *Compressive and hydraulic test equipment*, as shown in Figure C.1. It shall be capable of simultaneous application of a constant distorting force and a constant hydrostatic pressure.

**C.1.2** *Load-distribution plate*, the length of which is equal to the outside diameter of the pipe under test to apply the distorting force to the pipe.

**C.1.3** *Jig*, to hold the connecting pipes in the sockets of the chamber against the end thrust due to test pressure. The equipment shall not otherwise support the joint against the internal test pressure, and associated watertight plugs and end seals shall be secured accordingly.

### C.2 Test assembly

The test assembly shall comprise an inspection chamber assembled in accordance with the manufacturer's instructions together with a PVC-U pipe in accordance with BS EN 1401-1 and which is supported as shown in Figure C.1, unless the chamber is not designed to joint to BS EN 1401-1 pipe, in which case the assembly shall be tested using the flexible pipe system nominated by the manufacturer. The test assembly shall be placed so that the face of the socket under test is 10 mm from the end of the load-bearing plate.

### C.3 Procedure

Apply a force to the pipe so as to cause not less than a 10 % reduction in the original diameter of the pipe, when measured at the end of the plate remote from the face of the socket under test. Fill the test assembly with water, to within 25 mm of the top of the assembly. After the specified interval, inspect the test assembly externally for visible signs of leakage.

### C.4 Test report

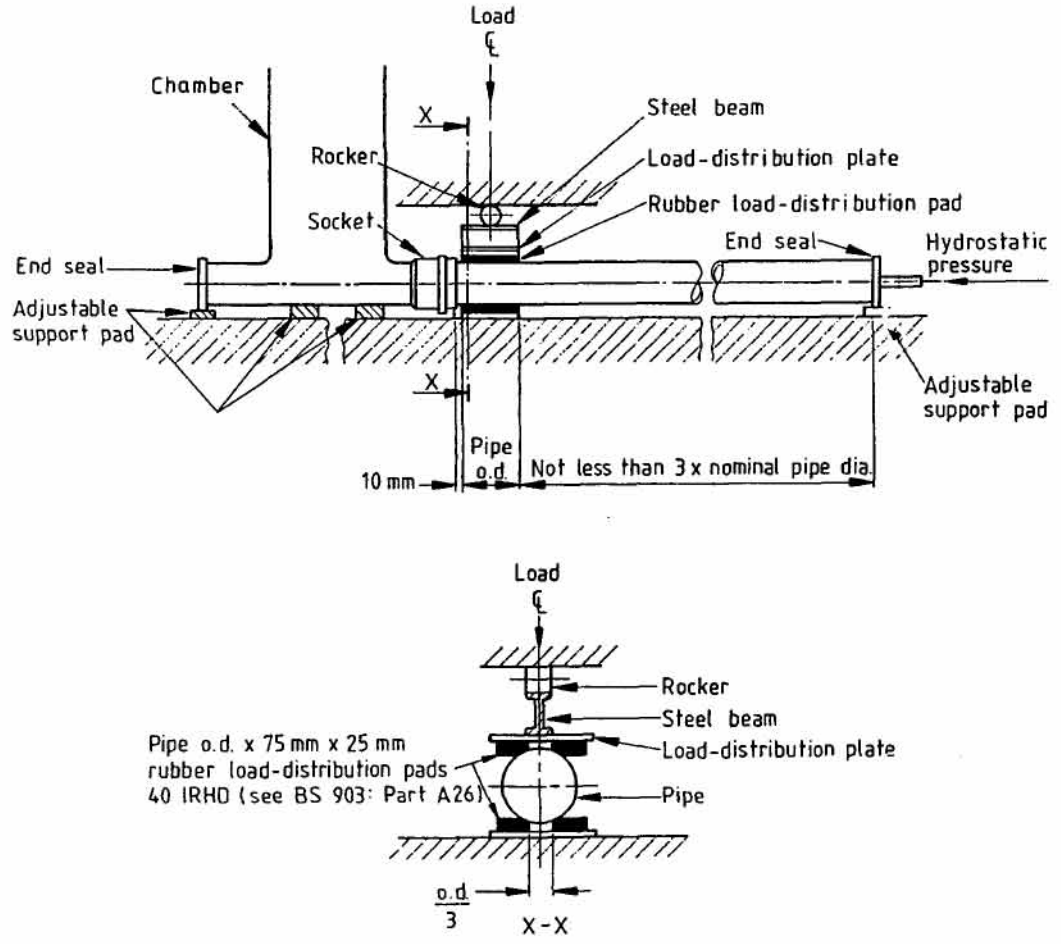
The test report shall include:

a) the identification of the components of the test assembly;

b) a reference to this method of test;

c) a report of whether or not leakage was observed;

d) the date of the test.




Dimensions in millimetres

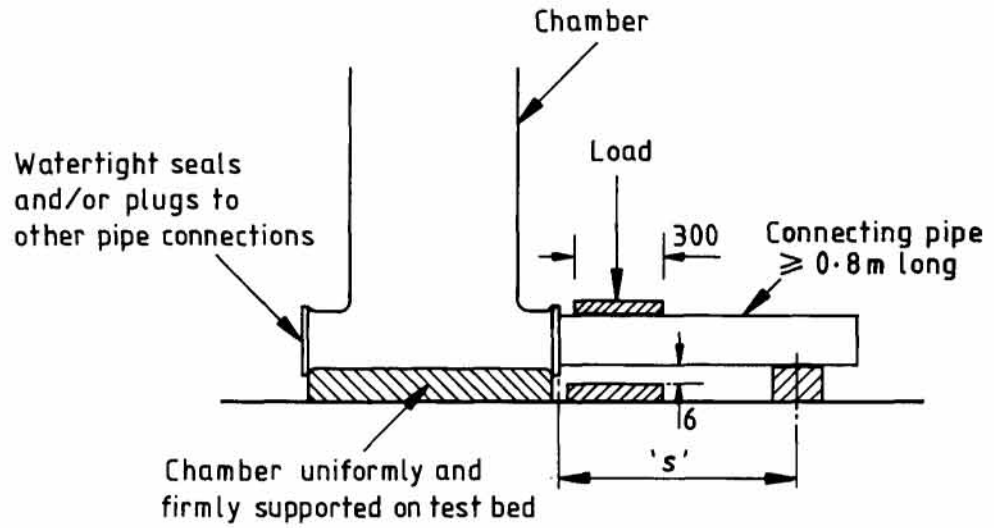
**Figure C.1 — Typical features of equipment for diametric distortion test**

## Annex D (normative)
## Method of test for shear resistance of chamber joint assemblies with rigid pipe systems

### D.1 Apparatus

**D.1.1** *Compressive and hydraulic test equipment*, as shown in Figure D.1. It shall be capable of simultaneous application of a constant shear force and a constant hydrostatic pressure. The shear force shall be applied over a longitudinal distance of 300 mm from the face of either the socket of the connection to the inspection chamber or any other device used for forming the connection to the inspection chamber.

**D.1.2** *Jig*, to restrain the inspection chamber from movement and hold the connecting pipe against the end thrust due to test pressure. A stop shall be provided to restrict the vertical movement of the pipe immediately adjoining the inspection chamber to a maximum of 6 mm. This stop shall be formed to prevent damage to the pipe. Watertight plugs or seals on the ends of the assembly shall be secured such that they provide no support or constraint for the joint under test except as given in **D.3.1**.




Dimensions in millimetres

**Figure D.1 — Typical features of equipment for shear resistance test**

### D.2 Test assembly

The test assembly shall consist of an inspection chamber assembled in accordance with the manufacturer's instructions together with a pipe, not less than 0.8 m long, from a specified system of rigid pipes and fittings in accordance with BS EN 752-3:1997, NA, e.g. as specified in BS EN 295-1.

### D.3 Procedure

**D.3.1** Support the inspection chamber uniformly and firmly with its axis vertical, on a test bed such that the connecting pipe is first fully engaged in the joint, axially aligned and then separated by 5 mm on the longitudinal axis with its end restrained to prevent further longitudinal movement.

Carry out the tests described in **D.3.2** and **D.3.3** as applicable.

**D.3.2** Support the connecting pipe at a distance from the joint under test of not less than *s* as given in Table D.1, and then apply a shear force of 25 N per millimetre of nominal size of pipe as shown in Figure D.1. Fill the test assembly with water to within 25 mm of the top of the chamber. After the appropriate test period, inspect the test assembly for visible cracking (see **3.8**) or signs of leakage.

**D.3.3** For a joint assembly that undergoes the full vertical movement of 6 mm when tested in accordance with **D.3.2**, carry out the following additional test. Apply the shear force with the test assembly set up as before but with the underside of the joint assembly supported on a firm flat surface and restrained from movement. Fill the test assembly with water to within 25 mm of the top of the chamber. After the appropriate test period inspect the test assembly externally for visible cracking (see **3.8**) or signs of leakage.

### D.4 Test report

The test report shall include:

a) the identification of the components of the test assembly;

b) a reference to this method of test;

c) a report of the occurrence of any leakage or cracking of the inspection chamber or its joints;

d) the date of the test.

**Table D.1 — Support distance for shear resistance tests**

| Length of connecting pipe<br>m | Support distance<br>*s*<br>m |
|---|---|
| ≥ 0.8 ≤ 1.2 | Immediately behind pipe socket or at the end of the pipe remote from the joint assembly |
| > 1.2 ≤ 1.6 | 1.0 |
| > 1.6 ≤ 2.2 | 1.2 |

## Annex E (normative)
## Method of test for resistance to elevated temperature cycling (for inspection chambers shallow)

### E.1 Apparatus

**E.1.1** *Hydraulic system*, incorporating a supply of hot water and a supply of cold water.

**E.1.2** *Arrangement of valves, pipework and timers*, to enable an alternate discharge of a controlled amount of hot water and cold water to be made through the test assembly (see **E.2**).

**E.1.3** *Means for the control, measurement and recording of the water temperature*, at the inlet of the assembly under test.

**E.1.4** *Device for counting the number of cycles achieved.*

### E.2 Test assembly

The test assembly shall comprise an inspection chamber of which the branch arms are fitted, where applicable, with watertight seals and plugs and the main through channel is connected, in accordance with the manufacturer's instructions, to the system for subjecting that through channel to the alternating passage of hot and cold water. In the case where connection includes an associated fitting, such as a joint adapter, which incorporates any weld lines, the fitting shall be so positioned that the flow will be brought into contact with the weld line.

### E.3 Procedure

While maintaining the ambient temperature at (17 ± 5) °C, subject the test assembly to the following schedule for 2 500 continuous cycles:

a) pass (35 ± 3) l of water at (85 ± 1) °C during a period of 90 s to 95 s;

b) rest and drain the installation for 60 s to 70 s;

c) pass (35 ± 3) l of water at a temperature not exceeding 22 °C over a period of 90 s to 95 s;

d) rest and drain the installation for 60 s to 70 s;

e) return to a).

At the end of the test, examine the inspection chamber and its joints for visible cracking (see **3.8**) or signs of leakage.

### E.4 Test report

The test report shall include:

a) the identification of the components of the test assembly;

b) a reference to this method of test;

c) a report of the occurrence of any leakage or visible cracking of the inspection chamber or its joints;

d) the date of test.

# Annex F (normative)
# Method for the determination of specific tangential initial stiffness (STIS)

## F.1 Apparatus

**F.1.1** *Loading frame*, with two rigid parallel plates or beams to which a compressive force can be applied to the test piece (see **F.2** and Figure F.1) such that the force and the resulting deflection of the test piece in the direction of the force can be measured with an accuracy of ±1 %. For non-circular sections, the bearers shall have a width not greater than 25 mm. When the outside of the chamber has a change in cross-section and this is incorporated within the test piece, the bearers shall be shaped to accommodate this (see Figure F.1). For the purposes of this test, a regular rib configuration is considered not to be a change in cross-section, and the load imposed as indicated in Figure F.1 can be applied just to the crests of the ribs. The centre of loading shall be so arranged that the vertical deflections of the two ends of the test piece differ by not more than 1 mm. Where the surface of the outside of the chamber does not provide a smooth bearing contact, the bearers may be surfaced with a strip, of not less than 3 mm thick, of elastomeric material of (50 ± 5) IRHD hardness, when determined in accordance with BS 903-A26. The length of each bearer shall be not less than the length of the test piece.

**F.1.2** *Means of measuring the length to an accuracy of ±1 % and the force and deflection to an accuracy of ±1 % in the direction of the applied force.*

## F.2 Test pieces

Each test piece shall be open at both ends and not less than 200 mm in length (or such length as is necessary to maintain symmetry of section) and, if cut off, e.g. base removed, it shall be cut smoothly and perpendicular to the main axis.

## F.3 Test conditions

The test shall be conducted at a temperature of (17 ± 5) °C.

## F.4 Procedure

Carry out the following procedure, completing each loop of steps a) to c) inclusive in a period of between 5 min and 6 min.

a) Assemble the test piece symmetrically in the test apparatus. The line of loading and support for non-circular sections shall be at the centre of the longest side.

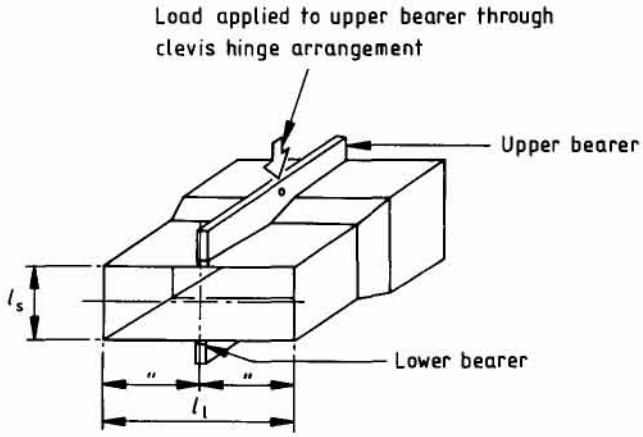
b) Determine the datum for deflection at zero load without applied force.

c) Apply sufficient force to obtain a deflection of 1 % to 7 %. If the test piece incorporates a change in cross-section on the inside of the chamber the deflection shall be determined on either:

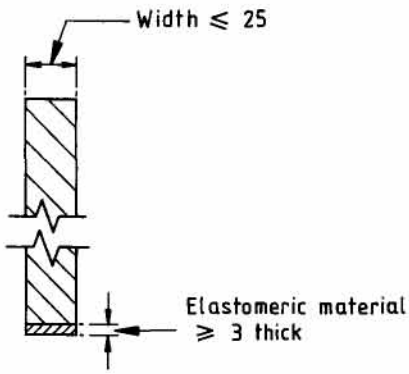
1) the smallest internal diameter for a circular cross-section; or

2) on the short side of the smallest cross-section for a non-circular section.

d) Repeat the test for two further similar test pieces.




NOTE Bearers may be surfaced with a strip of elastomeric material.




Typical section of upper bearer

Dimensions in millimetres

**Figure F.1 — Typical loading arrangement for non-circular sections with variable cross-section**

### F.5 Calculation

Calculate the specific tangential initial stiffness, STIS, (in Pa) from the following equation:

$$\text{STIS} = \frac{0.018\ 6}{L} \times \frac{F}{Y} \times S_F$$

where

$F$ is the arithmetic mean (in newtons) of the three forces;

$L$ is the arithmetic mean (in metres) of the three specimen lengths;

$Y$ is the arithmetic mean (in metres) of the three deflections;

$S_F$ is the shape factor, the value of which depends upon the shape of the test piece section as follows:

a) for circular sections

$S_F = 1.0$

b) for rectangular sections

$$S_F = 0.56\left[\frac{l_1^{\,4} + (4l_1^{\,3}l_s)}{l_s^{\,3}(l_1 + l_s)}\right]$$

where

$l_1$ is the length (in metres) of the long side;

$l_s$ is the length (in metres) of the short side.

If the test chamber incorporates a change in cross-section on the inside of the chamber, the value of $S_F$ used shall be the mean value of that for the maximum dimension and that for the minimum dimension.

## Annex G (normative)
## Method of test for resistance to vertical loading

### G.1 Principal

Two test methods are described and designated for different applications as follows:

a) A static method for loading chambers intended only for use in areas covered by surface loading categories A15 and B125.

b) A dynamic method for loading chambers intended for use in areas covered by surface loading categories C250 and D400.

### G.2 Static method

#### G.2.1 *Apparatus*

**G.2.1.1** *Top bearing block*, with dimensions related to the clear opening size of the chamber as described in BS EN 124:1994. The block shall be faced with hard rubber or other resilient material and be sufficiently rigid to ensure that the test load is evenly distributed.

**G.2.1.2** *Gravel filled box*, suitable to provide support for the test assembly whilst applying the vertical test load.

NOTE A suitable gravel filled box is described in prEN 1437.

**G.2.1.3** *Device for applying a load at least 25 % greater than the test load specified in EN 124 for the A15 or B125 test load*, accurate to within 2 % of the indicated load.

**G.2.1.4** *Measuring device*, suitable for indicating deflection measurements to within ±0.5 mm.

### G.2.2 *Test assembly*

The inspection chamber, along with cover and frame, shall be assembled in accordance with the manufacturer's instructions ensuring that any telescopic sections are closed to ensure that the load is transmitted fully from cover to base. The riser section shall be reduced in height as necessary to ensure that the assembly does not exceed 1.0 m from cover to invert.

### G.2.3 *Procedure*

Place the complete assembly in the test box on a base of 150 mm ± 50 mm thick compacted gravel, and ensure that the assembly is vertical, centred under the loading device and that the invert profiles are fully supported by the gravel. Fill the box with gravel in two equal stages, ensuring compaction.

NOTE A suitable procedure for filling the box is described in prEN 1437.

If the manufacturer recommends the use of a collar to support the frame and lid in service, incorporate a collar of similar size on the underside of the frame, ensuring a gap of at least 1 mm between riser and collar.

Place the top bearing block on the cover and lower the loading device into contact with the bearing block.

Applying the grade A15 or B125 design load as specified in BS EN 124:1994.

On completion of the loading, remove the loading mechanism and the cover of the inspection chamber whilst still supported by the gravel. Identify and measure the maximum point of internal deformation in the horizontal axis. Measure this point on an untested assembly and compare the two measurements.

### G.2.4 *Test report*

The test report shall include:

a) the identification of the inspection chamber;

b) a reference to this method of test (static);

c) the maximum change in the horizontal dimensions of the assembly;

d) a report of any damage observed, particularly visible cracking;

e) the date of the test.

## G.3 Dynamic method

### G.3.1 *Apparatus*

**G.3.1.1** *Dynamic wheel loading machine*, capable of applying a simulated dynamic traffic load onto an installed inspection chamber via its cover and frame. The apparatus shall be capable of simulating both a single drive tyre and wheel and twin rear axle wheels and tyres as permitted for use on a lorry.

**G.3.1.2** *Surface measuring equipment*, such as a theodolite or other means of determining a difference of levels.

#### G.3.1.3 *Test assembly*

The inspection chamber, along with cover and frame shall be assembled, installed and backfilled in a test pit in accordance with the manufacturer's instructions. The riser section shall be reduced in height to the minimum recommended by the manufacturer. Where support slabs are required, they shall be installed to the required level.

Construct a roadway above the assembly with the top surface level with the top of the inspection chamber cover, in accordance with either *Specification for highway works* or alternatively *Specification for the reinstatement of openings in highways*, depending upon the intended installation.

#### G.3.1.4 *Procedure*

Subject the completed construction to the passage of the loads specified in Table G.1 in accordance with the cycling regime:

a) a single wheel loaded to 4 tonnes passing at 20 km/h;

b) twin rear axle wheels loaded to 5.75 tonnes (2.875 tonnes per wheel) passing at 20 km/h.

Table G.1 — Loads

| Cyclic load | C250 Chamber | D400 Chamber |
|---|---|---|
| Single drive wheel centre line pass | 50,000 | 50,000 |
| Single drive wheel offset to chamber edge | 15,000 | 15,000 |
| Single drive wheel offset to opposite chamber edge | n/a | 15,000 |
| Twin rear axle wheels centre line pass | 50,000 | 50,000 |
| Twin rear axle wheels centre line offset to chamber edge | 15,000 | 15,000 |
| Twin rear axle wheels centre line offset to opposite chamber edge | n/a | 15,000 |

**G.3.1.5** *Test report*

The test report shall include:

a) the identification of the inspection chamber;

b) a reference to this method of test (dynamic);

c) the maximum change in the level between the frame and the adjacent road surface also subjected to the dynamic loading at a distance of 250 mm from the edge of the frame;

d) the date of the test.

## Annex H (informative)
## Guidance on use of inspection chambers relative to surface load and installation procedures

The surface load categories are classified in BS EN 124:1994 as follows:

A15 — areas which can only be used by pedestrians and pedal cyclists;

B125 — foot ways, pedestrian areas and comparable areas, car parks;

C250 — gully tops installed in the area of kerbside channels of roads which, when measured from the kerb edge, extend a maximum of 0.5 m into the carriageway and a maximum of 0.2 m into the footway;

D400 — carriageways of roads, hard shoulders, parking areas and similar (see BS EN 124:1994).

NOTE See also BS 7903.

Specifiers should ensure that they select product of the appropriate surface loading category. Reference must be made to the manufacturer's installation instructions, particularly the grade of cover and frame and its recommended support via the installation.

## Annex I (normative)
## Method of test for resistance to negative pressure (for inspection chambers deep)

### I.1 Apparatus

**I.1.1** *Watertight seals and/or plugs*, to suit open connections of inlets and outlets and the riser top.

**I.1.2** *Negative air pressure source and pressure measuring device*, suitable for testing at the specified internal negative air pressure.

**I.1.3** *Temperature-controlled environment*, capable of maintaining a test assembly (see **I.2**) within the specified temperature range when testing in accordance with **I.3**.

### I.2 Test assembly

The test assembly shall consist of an inspection chamber base with first joint to the riser assembled in accordance with manufacturer's instructions together with watertight seals and/or plugs secured to the inlet, outlet, and riser top, e.g. as shown in Figure I.1.

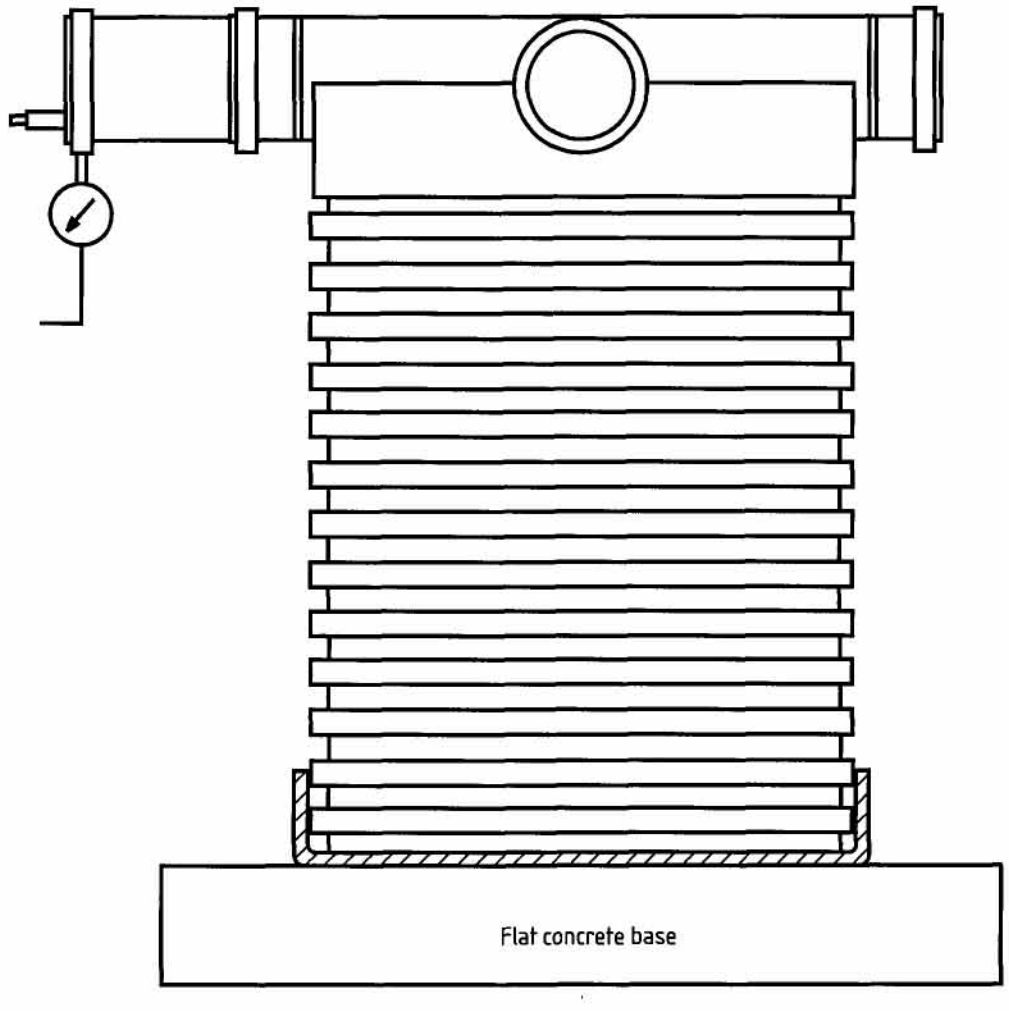



**Figure I.1 — Test assembly**

### I.3 Procedure

Position the test assembly upside down, with the axis of the inspection chamber vertical, on a flat base in a temperature-controlled environment at a temperature of (23 ± 2) °C.

Fix a metallic straight edge to the inlet and outlet sockets and measure the initial reference distance between the straight edge and the base of the chamber at its mid-point.

Select the test pressure from Table I.1 and subject the test assembly to the applicable negative pressure for the specified time. Measure and record the distance between the straight edge and the base of the chamber to the same mid-point.

Isolate the test assembly from the negative air pressure source whilst maintaining the internal vacuum for a further period of 30 min. Measure the internal negative pressure at the end of the 30 min period and record any loss of partial vacuum.

### I.4 Test report

The report shall include:

a) the identification of the components of the test assembly;

b) a reference to the method of test, i.e. BS 7158:2001, Annex I;

c) the initial reference measurement and the measurement after any distortion caused by the negative internal pressure after the testing period with internal pressure still applied;

d) a report on whether and how much loss of vacuum occurred;

e) the date of the test.

*Table I.1 — Classification of internal negative pressure*

| Inspection chamber deep, maximum installation depth 4 m | Test temperature °C | Internal negative pressure bar | Test period h |
|---|---|---|---|
| PE | 23 ± 2 | −0.4 | 100 ± 2 |
| PP | 23 ± 2 | −0.4 | 100 ± 2 |
| PVC-U | 23 ± 2 | −0.4 | 100 ± 2 |
| **Inspection chamber deep, maximum installation depth 6 m** | **Test temperature °C** | **Internal negative pressure bar** | **Test period h** |
| PE | 23 ± 2 | −0.6 | 100 ± 2 |
| PP | 23 ± 2 | −0.6 | 100 ± 2 |
| PVC-U | 23 ± 2 | −0.6 | 100 ± 2 |

## Annex J (informative)
## Guidance on quality control testing

The following guidance on the nature of the requirements and test methods specified in this standard is provided to assist in the preparation of quality plans for the manufacture of inspection chambers in accordance with this standard.

Type tests are intended to prove the suitability and performance of a material composition, compounding or processing technique or design or size of an inspection chamber, with or without the raising piece(s) as applicable. Such tests should be performed when a change is made either in material composition, compounding or processing technique or to the design or size or method of manufacture of the chamber or raising piece, but they may be performed more frequently by incorporation into a plan for monitoring the consistency of manufacture.

Inspection tests are carried out during and/or following manufacture to monitor the quality of product chambers or raising pieces. Certain test methods and associated requirements have been included because of the practicability and speed with which they may be performed in conjunction with a production process in comparison with some of the type tests.

Each requirement is classified in Table J.1 as being considered particularly suitable for type test and/or inspection test purposes. Some of the requirements are relevant to both type and inspection testing, e.g. those for dimensions. Attention is drawn to possible use of alternative inspection procedures and equipment for production quality control purposes to the methods required by a British Standard specification for establishing the properties of the final product under the conditions specified in the standard. For example, for monitoring of specific tangential stiffness for chambers of an established shape and material (perhaps on-line), see Table J.1 and the associated footnote.

If an inspection chamber is intended for use with a specific system of other components which are themselves subject to sampling or verification requirements, it is recommended that the inspection chambers be made subject to a method of sampling or verification which is agreed to be no less stringent than, though not necessarily identical to, the requirements placed on any analogous components in the system with which the chamber is to be used.

**Table J.1 — Applicability of requirements and test methods**

| Property | Clause | Method | Test type | |
|---|---|---|---|---|
| | | | Type test | Inspection test |
| Materials | 4 | | × | |
| Dimensions | 5 | | × | ×[a] |
| Appearance | 6 | | × | × |
| Watertightness | 7.2 | Annex A, method A | × | × |
| | | Annex A, method B | × | |
| Resistance to angular deflection | 7.3 | Annex B | × | |
| Resistance to diametric distortion | 7.4.2 | Annex C | × | |
| Resistance to shear | 7.4.3 | Annex D | × | |
| Resistance to elevated temperature cycling | 7.5 | Annex E and Annex A, method A | × | |
| Specific tangential stiffness | 7.6 | Annex F | × | |
| Resistance to vertical loading | 7.7 | Annex G | × | |
| Resistance to internal negative pressure | 7.8 | Annex I | × | |
| Marking | 8 | | × | × |

[a] Applies to manufacturer's nominated dimensions.

# Bibliography

## Standards publications

BS 65, *Specification for vitrified clay pipes, fittings and ducts, also mechanical joints for use solely with surface water pipes and fittings.*

BS 4346, *Joints and fittings for use with unplasticized PVC pressure pipes — Part 3: Specification for solvent cement.*

BS 4660, *Thermoplastics ancillary fittings of nominal sizes 110 and 160 for below ground gravity drainage and sewerage.*

BS 5955-6, *Plastics pipework (thermoplastics material) — Part 6: Code of practice for the installation of unplasticized PVC pipework for gravity drains and sewers.*

BS 6209, *Specification for solvent cement for non-pressure thermoplastics pipe systems.*

BS 7903, *Guide to the selection and use of gully tops and manhole covers for installation within the highway.*

BS 8301, *Code of practice for building drainage.*

BS EN 295-1, *Vitrified clay pipes and fittings and pipe joints for drains and sewers — Part 1: Requirements.*

BS EN 681-3, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 3: Cellular materials of vulcanized rubber.*

BS EN 681-4, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 4: Cast polyurethane sealing elements.*

BS EN 752-1:1996, *Drain and sewer systems outside buildings — Part 1: Generalities and definitions.*

BS EN 752-2, *Drain and sewer systems outside buildings — Part 2: Performance requirements.*

BS EN 752-4, *Drain and sewer systems outside buildings — Part 4: Hydraulic design and environmental considerations.*

BS EN 752-5, *Drain and sewer systems outside buildings — Part 5: Rehabilitation.*

BS EN 752-6, *Drain and sewer systems outside buildings — Part 6: Pumping installations.*

BS EN 752-7, *Drain and sewer systems outside buildings — Part 7: Maintenance and operations.*

BS EN 1610, *Construction and testing of drains and sewers.*

BS EN 45011, *General requirements for bodies operating product certification schemes.*

DIN 1259-1:1986, *Glas — Teil 1: Begriffe für Glasarten and Glasgruppen.*

prEN 1437, *Plastics piping systems — Piping systems for underground drainage and sewerage — Test method for resistance to combined temperature cycling and external loading.*

prEN 13598-1, *Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) — Part 1: Specifications for ancillary fittings.*

ISO 2078:1985, *Textile glass — Yarns — Designation.*

## Other publications

[1] GREAT BRITAIN. *Safe work in confined spaces.* ISBN 0 717 61405 0. London: TSO, 1997.

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