BS 5834-1:2017

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Surface boxes, guards and underground chambers for the purposes of utilities

Part 1: Specification for guards and plinths

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Contents

Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 34, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 5834 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 28 February 2017. It was prepared by Technical Committee B/504, *Water supply*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This part of BS 5834 supersedes BS 5834-1:2009, which is withdrawn.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Requirements in this standard are drafted in accordance with *Rules for the structure and drafting of UK standards*, subclause **J.1.1**, which states, "Requirements should be expressed using wording such as: 'When tested as described in Annex A, the product shall ...'". This means that only those products that are capable of passing the specified test will be deemed to conform to this standard.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Section 1: General

1 Scope

This part of BS 5834 specifies requirements and test methods for:

a) vitrified clay, unreinforced concrete, and plastic guards and plinths for use with utility apparatus and surface boxes (conforming to BS 5834-2); and

b) boundary boxes for water service pipes consisting of flow-isolation and meter receptacle suitable for concentric manifold meters with G 1½" and G 2" connections (conforming to BS EN ISO 4064-4), contained within base units and guard tubes made from a thermoplastic or thermoset material for use with surface boxes (conforming to BS 5834-2).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 65:1991, *Specification for vitrified clay pipes, fittings and ducts, also flexible mechanical joints for use solely with surface water pipes and fittings*

BS 3123, *Specification for spring calipers and spring dividers*

BS 4484-1, *Specification for measuring instruments for constructional works – Part 1: Metric graduation and figuring of instruments for linear measurement*

BS 5433, *Specification for underground stopvalves for water services*

BS 5834-2, *Surface boxes, guards and underground chambers for gas and the purposes of utilities – Part 2: Specification for surface boxes*

BS 8588:2017, *Polyethylene pressure pipe with an aluminium barrier layer and associated fittings for potable water supply in contaminated land – Size 20 mm to 630 mm*

BS EN 197-1, *Cement – Part 1: Composition, specifications and conformity criteria for common cements*

BS EN 197-4, *Cement – Part 4: Composition, specifications and conformity criteria for low early strength blastfurnace cements*

BS EN 450-1:2012, *Fly ash for concrete – Part 1: Definition, specifications and conformity criteria*

BS EN 934-2, *Admixtures for concrete, mortar and grout – Part 2: Concrete admixtures – Definitions, requirements, conformity, marking and labelling*

BS EN 1008:2002, *Mixing water for concrete – Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete*

BS EN 12201-1, *Plastics piping systems for water supply, and for drainage and sewerage under pressure – Polyethylene (PE) – Part 1: General*

BS EN 12201-2, *Plastics piping systems for water supply, and for drainage and sewerage under pressure – Polyethylene (PE) – Part 2: Pipes*

BS EN 12390-2, *Testing hardened concrete – Part 2: Making and curing specimens for strength tests*

BS EN 12390-3, *Testing hardened concrete – Part 3: Compressive strength test specimens*

BS EN 12620:2002, *Aggregates for concrete*

BS EN 13959:2004, *Anti-pollution check valves – DN 6 to DN 250 inclusive Family E, type A, B, C and D*

BS EN 15167-1, *Ground granulated blast furnace slag for use in concrete, mortar and grout – Part 1: Definitions, specifications and conformity criteria*

BS EN 15167-2, *Ground granulated blast furnace slag for use in concrete, mortar and grout – Part 2: Conformity evaluation*

BS EN ISO 4064-2, *Water meters for cold potable water and hot water – Part 2: Test methods*

BS EN ISO 4064-4:2014, *Water meters for cold potable water and hot water – Non-metrological requirements not covered in ISO 4064-1*

Other publications

[N1]WIS No. 4-23-04, *Specification for underground stop valves, including spherical valves, for potable water services for nominal sizes up to and including 63 and nominal pressures of 10 bar minimum and made principally of metal or thermoplastics*

3 Terms, definitions and symbols

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

3.1 Terms and definitions

3.1.1 boundary box
assembly of components consisting of base unit, manifold, guard tube (and integrated lid), normally installed on a water service pipe to premises, providing flow-isolation and metering facility

3.1.2 load-bearing boundary box
boundary box consisting of base unit, guard tube, and an integrated cover and frame where the surface load (or a major proportion thereof) is transmitted directly from the cover and frame through the walls of the guard tube to a base unit

3.1.3 non-load bearing boundary box
structure not designed to transmit surface load through the guard tube to the base unit

3.1.4 guard
circular pipe, or square sectional structure with a square or circular bore, used vertically to house utility apparatus and to permit access for inspection, operation and maintenance

3.1.5 guard tube
component of a boundary box installed upon a base unit, providing access to flow-isolation and metering facility contained therein

NOTE See Figure 1.

3.1.6 telescopic guard tube
guard tube with an integral height adjustment facility

3.1.7 base unit
lower section of the boundary box assembly providing support to inlet/outlet connection(s) and accommodation for the manifold

3.1.8 manifold
assembly comprising a flow isolation valve, concentric meter receptacle and a check valve

NOTE A flow isolation valve is also known as a stop valve/stop tap.

3.1.9 inlet/outlet
manifold water supply connection point

3.1.10 integrated surface box
box designed and supplied by the manufacturer for the specific application of a particular model or type of boundary box

3.1.11 cementitious content
quantity of cement plus any pozzolanic or latent hydraulic addition in the concrete mix measured in kg/m^3

3.1.12 plinth
component that provides additional support to a guard

3.1.13 section
make up or base component of a sectional guard

3.1.14 type
units of the same manufacturing process and design

3.1.15 unit
pipe guard, section or plinth

3.2 Symbols

B depth of seating in concrete plinth (mm)

C minimum thickness of concrete plinth (mm)

D internal seating width of concrete plinth (mm)

E width of gap in seatings of concrete plinth (mm)

F diameter of recessed seating in concrete plinth (mm)

L overall length of pipe guard (mm)

N test per nominal size

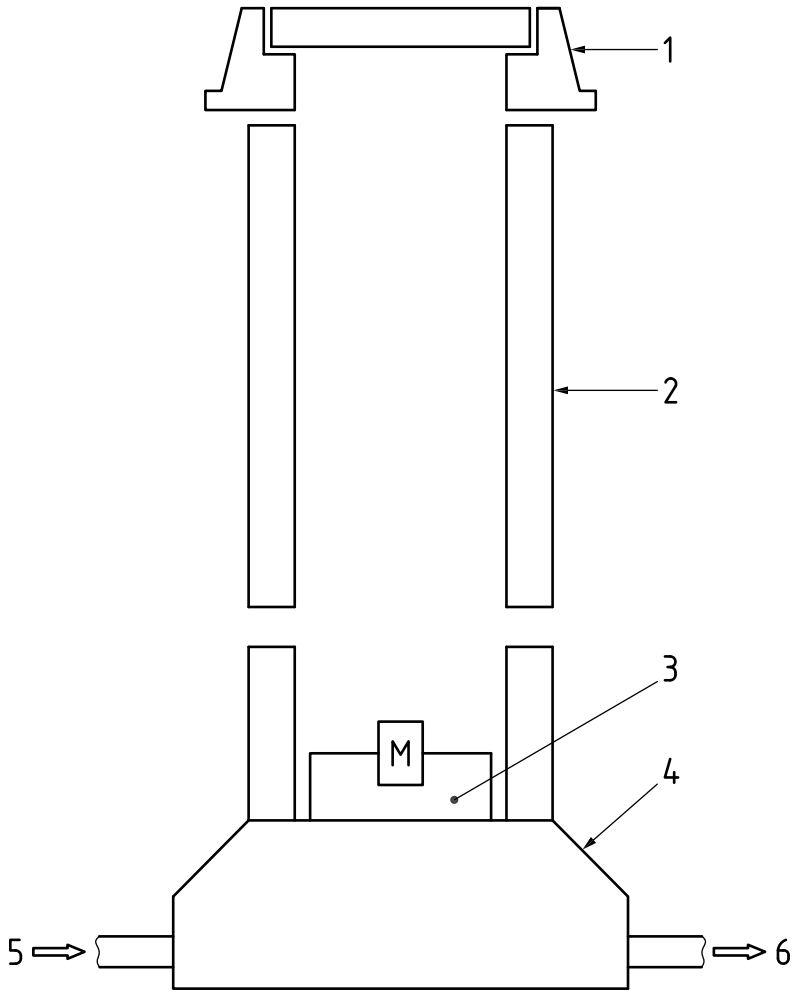
R routine inspection test

T initial type test

Y test per type produced per 1 000, with a minimum of one per type and year

X section/view lines

Figure 1 **Basic components of a meter boundary box: terminology**



Key

1	Surface box/cover and frame assembly	5	Inlet
2	Guard tube	6	Outlet
3	Manifold	M	Water meter
4	Base unit		

NOTE This figure is diagrammatic and is intended only to identify the terminology given to the component parts of a boundary box. This configuration is not intended to illustrate or imply any particular design, make or style of boundary box.

Section 2: Plinths and guards

4 Requirements for plinths and guards

4.1 Guards

*COMMENTARY ON **4.1***

In cases where ground conditions might be too soft to support the guard without settlement, guards should be provided with an appropriate plinth, particularly in connection with plastics pipes. However, the range of apparatus in service is such that specifying a standardized range of matching channels is considered impractical. Therefore purchasers wishing to use channelled plinths should discuss their specific requirements with potential suppliers.

4.1.1 Vitrified clay guards

Vitrified clay guards shall be of the pipe type and shall be provided with a flange at the top, with a width of face of not less than 23 mm [see Figure 2.a)]. The thickness of the flange shall be not less than 12.5 mm or the thickness of the wall of the guard, whichever is the greater.

4.1.2 Concrete guards

Concrete guards shall be of the pipe type [see Figure 2.b)] or sectional type [see Figure 3].

4.1.3 Plastic guards

When tested in accordance with **D.2**, load-bearing plastic guards shall deflect not more than 10 mm during the application of the load and show no visible signs of cracking.

NOTE 1 Plastic guards for stop taps are generally manufactured as non-load bearing.

NOTE 2 The guard tube should:

a) locate the surface box/cover and frame assembly. This may be either integral or via an additional adapter or component (e.g. "top hat"); and

b) adequately support the external backfill material and withstand its loading.

4.2 Plinths

4.2.1 Vitrified clay plinths

Vitrified clay plinths shall be of the circular plate type [see Figure 2.c)].

NOTE Vitrified clay plinths are suitable for use with guards made only from the same material.

4.2.2 Concrete plinths

Concrete plinths shall be of the slab type, when intended for use in conjunction with slotted guards and rigid utility apparatus, or of the channel type when intended for use with slotted or unslotted guards and non-rigid apparatus. Concrete plinths shall be square or circular in plan and incorporate seatings to form an interlock with the guard to prevent horizontal displacement. In slab type plinths the seatings shall be so designed as not to reduce the clearance provided by the slot in the guard.

NOTE 1 Typical patterns of concrete plinths are shown in Figure 4.

NOTE 2 In channel type concrete plinths the channels should be so constructed as to prevent harmful stresses occurring in the utility apparatus during operation. Channel plinths may be provided with a local recess to accommodate a plug cock.

NOTE 3 Concrete plinths may be either single or double channel types.

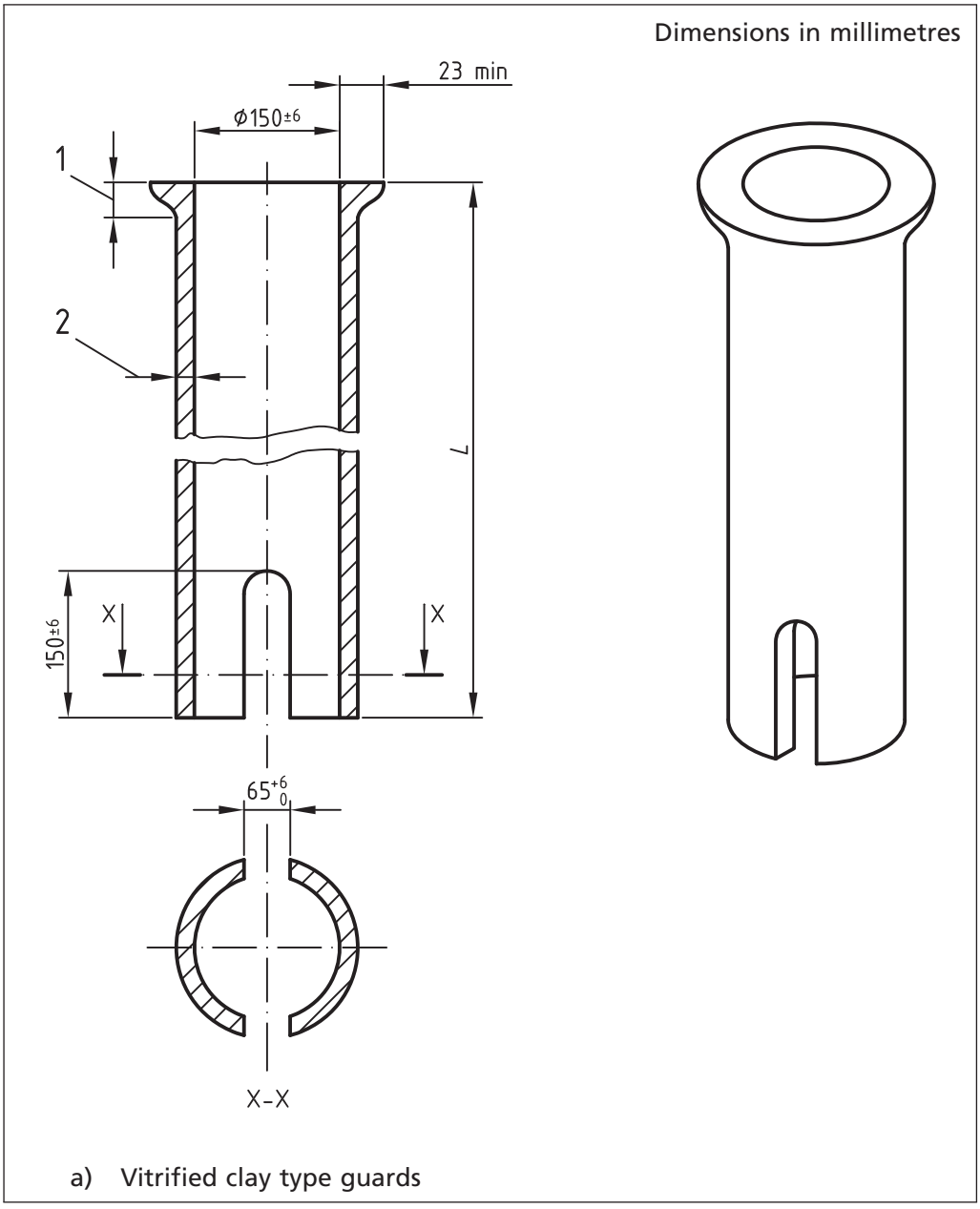
NOTE 4 Concrete plinths are suitable for use with concrete or vitrified clay guards.

4.2.3 Plastic plinths

Plastic plinths may be square or circular in plan, and shall incorporate seatings to form an interlock with the guard to prevent horizontal displacement.

NOTE Plinths may provide support for stop taps or other apparatus.

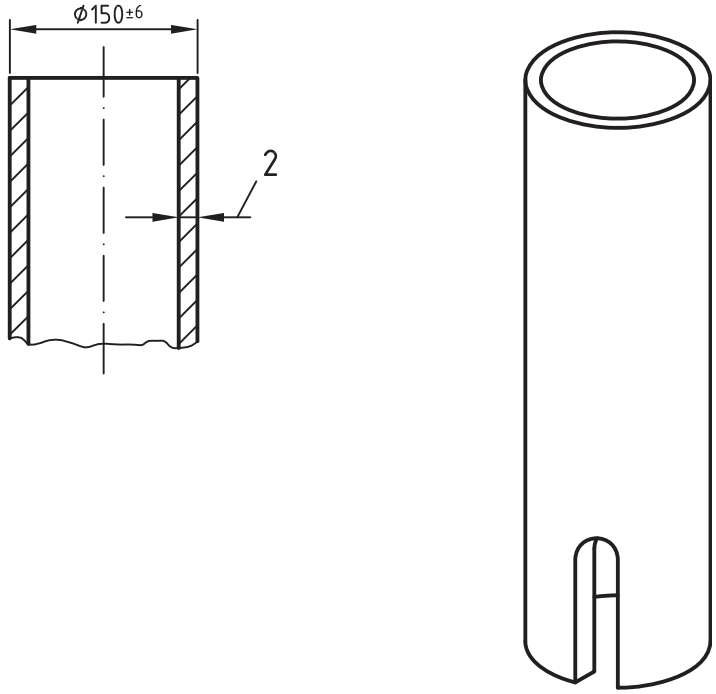
Figure 2 **Dimensions of pipe guards and vitrified clay plinths**



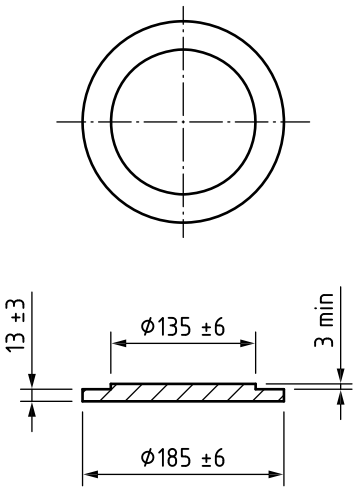
a) Vitrified clay type guards

Figure 2 **Dimensions of pipe guards and vitrified clay plinths**

Dimensions in millimetres



b) Concrete type guards



c) Vitrified clay foundation plinths

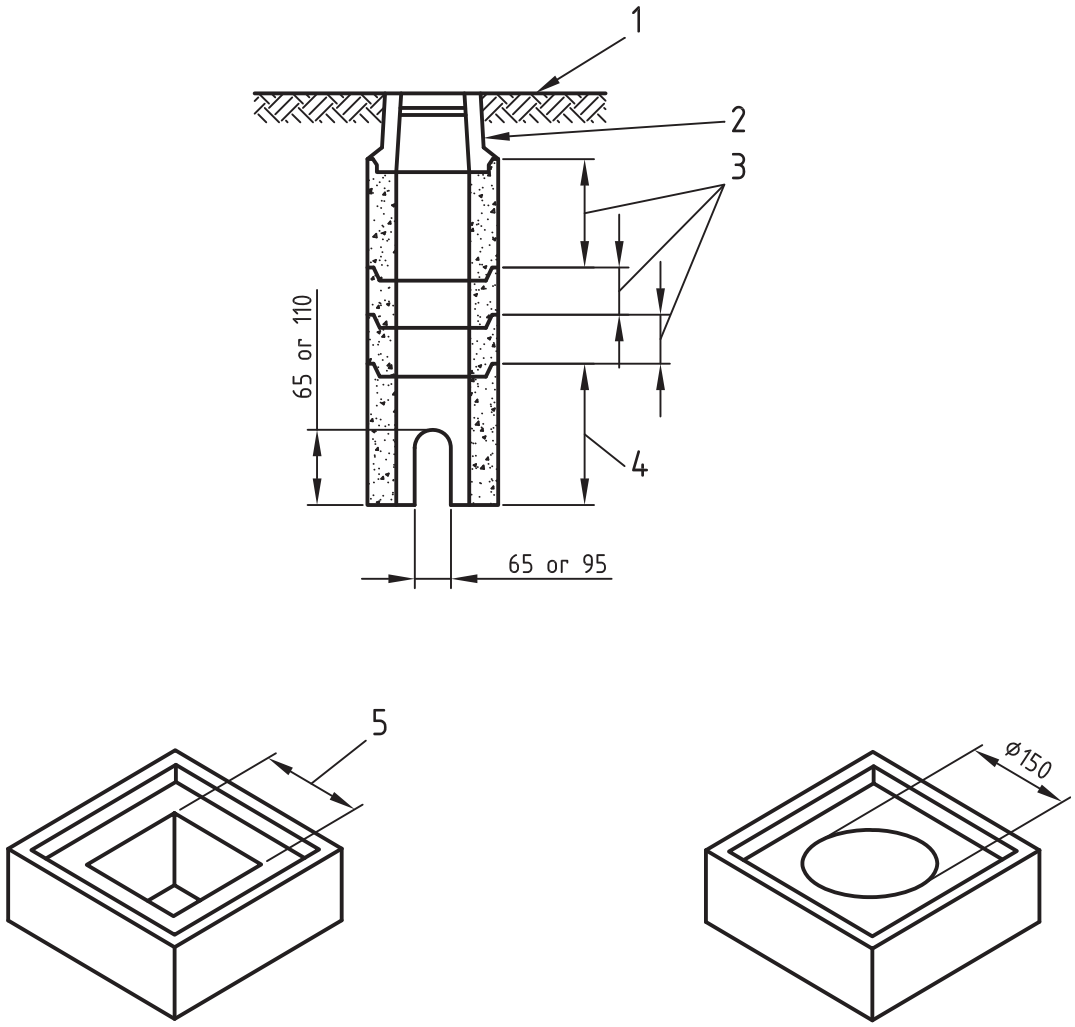
Key

1 See **6.1.1**

2 Wall thickness

Figure 3 **Dimensions of sectional guards**

Dimensions in millimetres



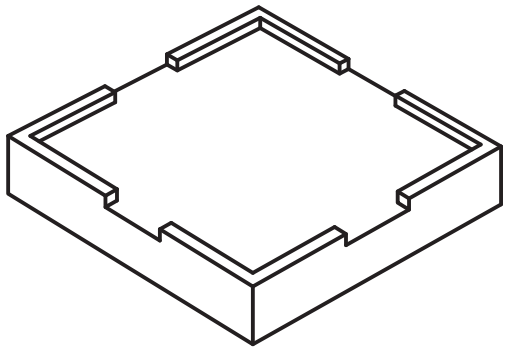
Key

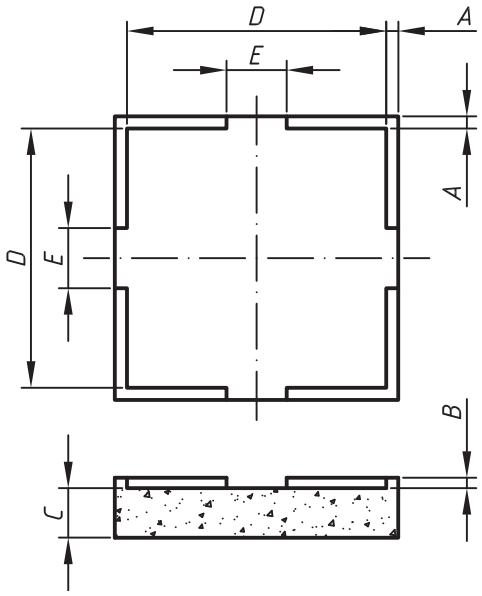
1 Ground surface
2 Surface box
3 Make-up sections 75, 100, 150 or 225
4 Slotted base section 150 or 225
5 150 × 150 or 175 × 175 square

4.3 Dimensions of units

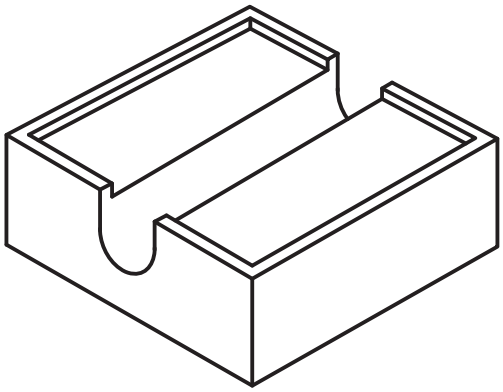
The dimensions of a unit shall conform to **6.2** to **6.6** inclusive, as appropriate to that unit, when measured in accordance with Annex B.

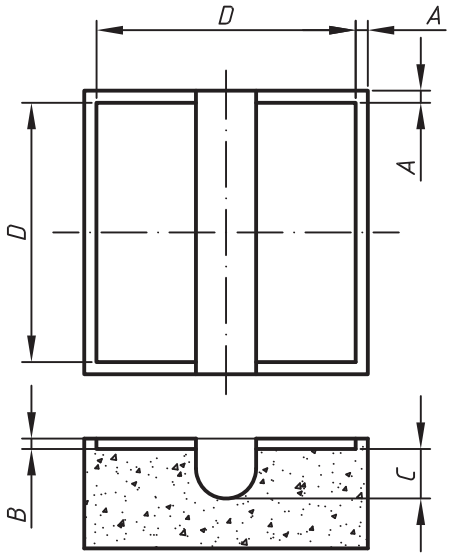
Figure 4 **Through-channel type to suit concrete pipe type guards**





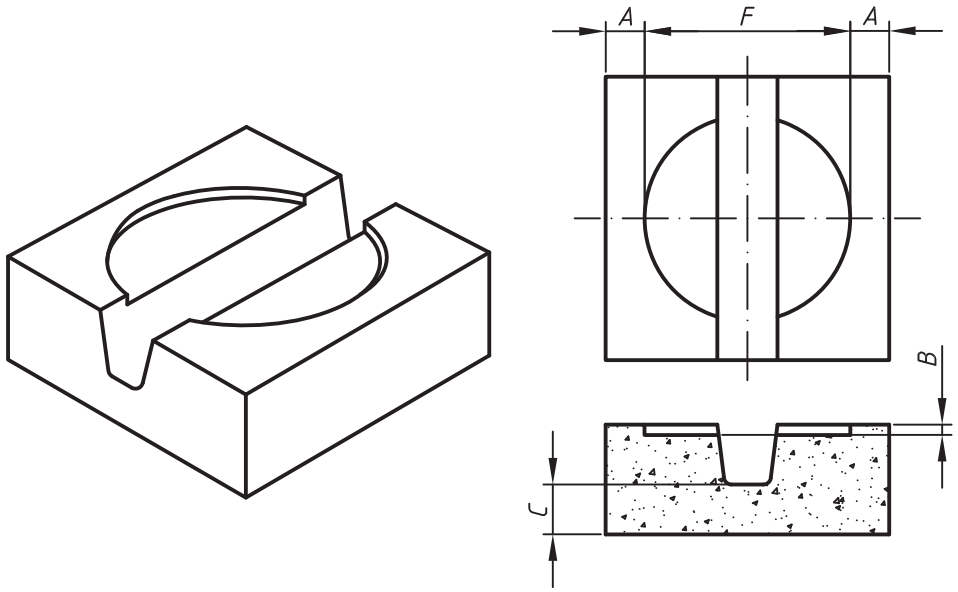
a) Slab type





b) Through-channel type to suit section type guard

Figure 4 **Through-channel type to suit concrete pipe type guards**



c) Through-channel type to suit pipe type guard

Key

A	10 mm min	*D*	Either 245 $^{+6}_{0}$ mm in 150 × 150 mm unit or 295 $^{+6}_{0}$ in 175 mm × 175 mm unit
B	10 mm min		
C	35 mm min	*E*	65 $^{+10}_{0}$ mm or 95 $^{+10}_{0}$ to match slot in guard
		F	220 $^{+6}_{0}$

5 Constituent materials and surface finish for guards and plinths

5.1 Vitrified clay units

Units shall be made from suitable clays and fired to vitrification. Units shall be sound and free from such defects as would impair their function when in service.

NOTE 1 Units may be glazed or unglazed on the interior and/or exterior.

NOTE 2 Visual imperfections, such as missing glaze, unevenness and slight surface damage, are acceptable, provided the durability of the unit is unaffected.

5.2 Concrete for units

5.2.1 Constituents

5.2.1.1 Cements

Cements shall conform to **5.2.5**.

5.2.1.2 Aggregates

Aggregates shall conform to BS EN 12620.

*NOTE BS EN 12620:2002, **4.3.7** permits special aggregate gradings where these are needed to suit the manufacturing process, provided the special grading envelopes are defined using the R20 series of sieves specified in ISO 565:1990 and incorporate the appropriate sieves from a specified range of sizes.*

5.2.1.3 Admixtures

Admixtures shall conform to BS EN 934-2.

5.2.1.4 Additions

Additions shall be in the form of ground granulated blastfurnace slag (GGBS) or pulverized-fuel ash (PFA) conforming to BS EN 15167-1, BS EN 15167-2 and BS EN 450-1:2012, Category A or B, respectively.

5.2.1.5 Mixing water

Mixing water for concrete shall conform to BS EN 1008.

*NOTE BS EN 1008:2002, **3.1** states that potable water does not need testing.*

5.2.2 Concrete materials

Only materials specified in **5.2.1** shall be used.

5.2.3 Concrete strength

The characteristic compressive strength of the concrete shall be not less than 30 MPa (N/mm^2), which shall be verified by making and curing cubes or cylinders either:

a) in a manner equivalent to that used the manufacturing process; or

b) in accordance with BS EN 12390-2.

If method b) is adopted, a conversion factor shall be applied to the results of the tests to take into account differences between the manufacturing process and that used to produce the test specimens in accordance with the relevant part of BS EN 12390-2 and BS EN 12390-3. This conversion factor shall be determined by correlation tests, the results of which shall be made available for inspection. Correlation tests shall be repeated at least annually and whenever a change is made in the materials or manufacturing process.

The cubes or cylinders shall be tested in accordance with BS EN 12390-3.

The minimum rate of sampling concrete shall be in accordance with Table 1.

Table 1 **Minimum rate of sampling concrete**

Production	**Minimum rate of sampling**		
	First 50 m^3 of production	**Subsequent to first 50 m^3 of production** [A)]	
		Concrete with production control certification	**Concrete without production control certification**
Initial (until at least 35 test results are obtained)	3 samples	1/200 m^3 or 2/production week	1/150 m^3 or 1/production day
Continuous (when at least 35 test results are obtained)	—	1/400 m^3 or 1/production week	—

[A)] Sampling shall be distributed throughout the production and should be not more than one sample within each 25 m^3.

NOTE This table is consistent with the provisions of BS EN 206.

5.2.4 Concrete quality

The concrete in any unit shall be compacted, homogeneous and conform to **5.2.5**, **5.2.6** and **5.2.7**. Finished units shall be free from burrs.

5.2.5 Types of cement

The cement shall either:

a) be factory-produced by the cement manufacturer and conform to one of the following standards as appropriate:

1) CEM I BS EN 197-1;

2) CEM II/B-V BS EN 197-1;

3) BIII/B BS EN 197-4;

4) sulfate-resisting Portland conforming to BS 4027; or

b) consist of one of the following combinations of cement conforming to CEM I as specified in BS EN 197-1 and an addition in the form of GGBS or PFA in accordance with the following, to be included as part of the concrete mix by simultaneously combining them with the other concrete materials at the concrete mixer.

Cementitious component other than cement	Applicable standard	% (mm/m) of total cementitious content
ggbs	BS EN 15167-1, BS EN 15167-2	0 to 65
pfa	BS EN 450-1	15 to 35

In all cases where combinations of cement conforming to CEM I as specified in BS EN 197-1 and ggbs or pfa are used, the relevant proportion of ggbs or pfa shall be fully documented in the production records.

NOTE The manufacturer should keep production records to demonstrate compliance with this British Standard.

5.2.6 Cementitious content

The fully compacted concrete shall have a minimum cementitious content of not less than 340 kg/m^3.

NOTE 1 Units conforming to this part of BS 5834 are suitable for use in normal soil conditions, i.e. wet, rarely dry conditions, and a slightly aggressive chemical environment (generally the most adverse conditions for natural soils and groundwaters in the top metre or so of undisturbed ground).

Special attention shall be paid if more severe conditions are expected, primarily to the cement plus any permitted addition in the concrete (see Annex A).

NOTE 2 A "wet, rarely dry" condition for concrete surfaces subject to long-term water contact and a "slightly aggressive chemical environment", together with more severe environments, are defined in BS EN 206.

5.2.7 Chloride content

The amount of chloride ion in the concrete shall not exceed 0.4% by mass of the cementitious content.

6 Geometrical characteristics of guards

6.1 Pipe guards

6.1.1 Vitrified clay and concrete

When measured in accordance with **B.2.1**, the internal diameter of pipe guards shall be (150 ±6) mm.

6.1.2 Plastic

The manufacturer shall determine the dimensions of pipe guards.

NOTE 1 The manufacturer should take into account adequate working space for access, inspection, operation and maintenance of any installed stop tap or other specified device.

NOTE 2 The guard should adequately support the external backfill material and withstand its loading.

6.2 Sectional guards

6.2.1 Vitrified clay and concrete

When measured in accordance with **B.2.2**, sectional guards shall be externally square with either a square or circular bore having the following dimensions:

a) square bore guards:

   1) (150 ±6) mm × (150 ±6) mm; or

   2) (175 ±6) mm × (175 ±6) mm;

b) circular bore guards:

   1) (150 ±6) mm diameter.

When measured in accordance with **B.2.5**, the height of sections (see Figure 3) shall be as follows:

1) base sections:

   i) (150 ±6) mm; or

   ii) (225 ±6) mm;

2) make-up sections:

   i) (75 ±6) mm;

   ii) (100 ±6) mm;

   iii) (150 ±6) mm; or

   iv) (225 ±6) mm.

Sections shall have a joint to enable them to interlock; a typical example is given in Figure 3.

6.2.2 Plastic

The manufacturer shall determine the dimensions of sectional guards. Sections shall have a joint to enable them to interlock to prevent horizontal displacement.

NOTE 1 The manufacturer should take into account adequate working space for access, inspection, operation and maintenance of any installed stop tap or other specified device.

NOTE 2 The guard should adequately support the external backfill material and withstand its loading.

6.3 Wall thickness of guards

6.3.1 Vitrified clay guards

When measured in accordance with **B.2.2**, the wall thickness of vitrified clay guards shall be 18^{+6}_{-2} mm.

6.3.2 Concrete guards

When measured in accordance with **B.2.2**, the wall thickness of concrete guards shall be as follows:

- pipe guards: 25^{+6}_{-2} mm;
- sectional square bore guards:
  - 150 mm × 150 mm: 38^{+6}_{-2} mm;
  - 175 mm × 175 mm: 50^{+6}_{-2} mm;
- sectional circular bore guards: 38^{+6}_{-2} mm at the centre of each external face.

6.4 Size of slots in guards – Vitrified clay and concrete

When measured in accordance with **B.2.3**, the size of slots for accommodating utility apparatus shall be as follows:

a) pipe guards: (150 ±6) mm high × (65 ±6) mm wide;

b) sectional guards:

1) (65 ±6) mm high × (65 ±6) mm wide;

2) (65 ±6) mm high × (95 ±6) mm wide;

3) (110 ±6) mm high × (65 ±6) mm wide; or

4) (110 ±6) mm high × (95 ±6) mm wide.

The slots shall be arranged so that they are directly opposite each other. The slots shall be placed at the bottom of a pipe guard and in the base section of a sectional guard.

The tops of slots in concrete guards shall be semi-circular or semi-hexagonal in elevation. The tops of slots in vitrified clay guards shall be semi-circular in elevation.

NOTE It is permissible for vitrified clay guards to be manufactured with or without slots.

6.5 Straightness of pipe guards

The variation in straightness of pipe guards shall not exceed 1% of the nominal overall length of the guard when tested in accordance with BS 65:1991, Annex A.

6.6 Plinths

6.6.1 Vitrified clay

When measured in accordance with **B.3**, the dimensions of vitrified clay plinths shall be as shown in Figure 2.

6.6.2 Concrete

When measured in accordance with **B.4**, the essential dimensions of concrete plinths shall be as shown in Figure 4.

Section 3: Boundary boxes

7 Boundary boxes

7.1 General

7.1.1 Units shall comprise a number of separate or contiguous basic components in accordance with Figure 1, including at least a base unit (incorporating the inlet and outlet to the box), the main body housing the flow measurement and control mechanisms combined in a manifold, a guard tube, and a surface box/cover and frame assembly.

NOTE These basic components and terminology are illustrated diagrammatically in Figure 1.

7.1.2 Boundary boxes shall be designated with respect to the following characteristics.

a) Watertightness Class 1: watertight or Class 2: non-watertight.

b) Load-bearing:

   1) Boxes supplied without surface boxes: Grade A, B or C, or non-load bearing N;

   2) Boxes supplied with integrated surface boxes: Load-bearing, SB: Grade A, B or C in accordance with BS 5834-2.

c) Telescopic type with integral height adjustable facility T.

   EXAMPLE 1:

   A non-loadbearing watertight boundary box would be designated as "Class 1.N" box.

   EXAMPLE 2:

   A grade B load-bearing telescopic non-watertight boundary box would be designated as "Class 2.L.B.T".

   EXAMPLE 3:

   A Grade B load-bearing integrated surface box supplied with a telescopic non-watertight boundary box would be designated as "Class 2.N.SBB.T".

7.2 Manifold

A manifold shall consist of at least a meter receptacle (with or without a meter) conforming to **10.3.3**, a stop valve conforming to **10.3.5**, a check valve conforming to **10.3.6** and means of connection to the inlet and outlet pipework.

7.3 Watertightness

A Class 1 boundary box when tested in accordance with Annex H shall show no visible signs of water ingress.

NOTE The design of Class 1 boxes should take into account the potential risks from pressure build-up within the box which might be caused by internal leakage.

8 General design requirements

*COMMENTARY ON **CLAUSE 8***

Materials used and the construction of boundary boxes should have a design life of at least 50 years at maximum rated working pressure. This does not preclude certain components being determined as serviceable.

8.1 Maximum operating pressure

Boundary boxes shall be rated either PFA 12.5 bar or PFA 16 bar.

NOTE PFA is defined in BS EN 805:2000.

8.2 Load-bearing capacity

When tested in accordance with Annex D, Class L – A, B, and C and Class L – SB Grade A, B and C boundary boxes shall deflect not more than 10 mm during the application of the load and show no visible signs of cracking.

8.3 Load distribution

When tested in accordance with Annex D, there shall be no stress imposed from the base unit or guard tube onto connecting pipework or fittings.

8.4 Existing service depth range

The manufacturer shall declare:

a) the range of service pipe depths which specific boundary box models are intended for; and

b) the increments by which the range of service pipe depths are accommodated.

NOTE It is advisable that designs are able to achieve alignment of the surface box to the pavement within a maximum of ±6 mm. For further guidance see HAUC Code of Practice [1].

8.5 Width of guard tube

The internal dimensions of the guard tube shall accommodate a meter in accordance with BS EN ISO 4064-4 and facilitate normal maintenance operations.

NOTE Users/specifiers should consider the access provided for visual meter reading and maintenance by the internal dimensions of surface boxes considered for use in conjunction with guard tubes.

8.6 Manifold environment

NOTE The design of the guard tube/base unit should have minimal risk of contamination during both operational and maintenance procedures taking into account the following circumstances:

1) commissioning/flushing of the service pipe and boundary box;

2) meter exchanges; and

3) servicing of the stop tap/non-return valve (NRV).

This risk can be minimized by provision of a dewatering facility in the form of a raised manifold and/or sufficient volume in the base unit below the upper edge of the manifold receptacle.

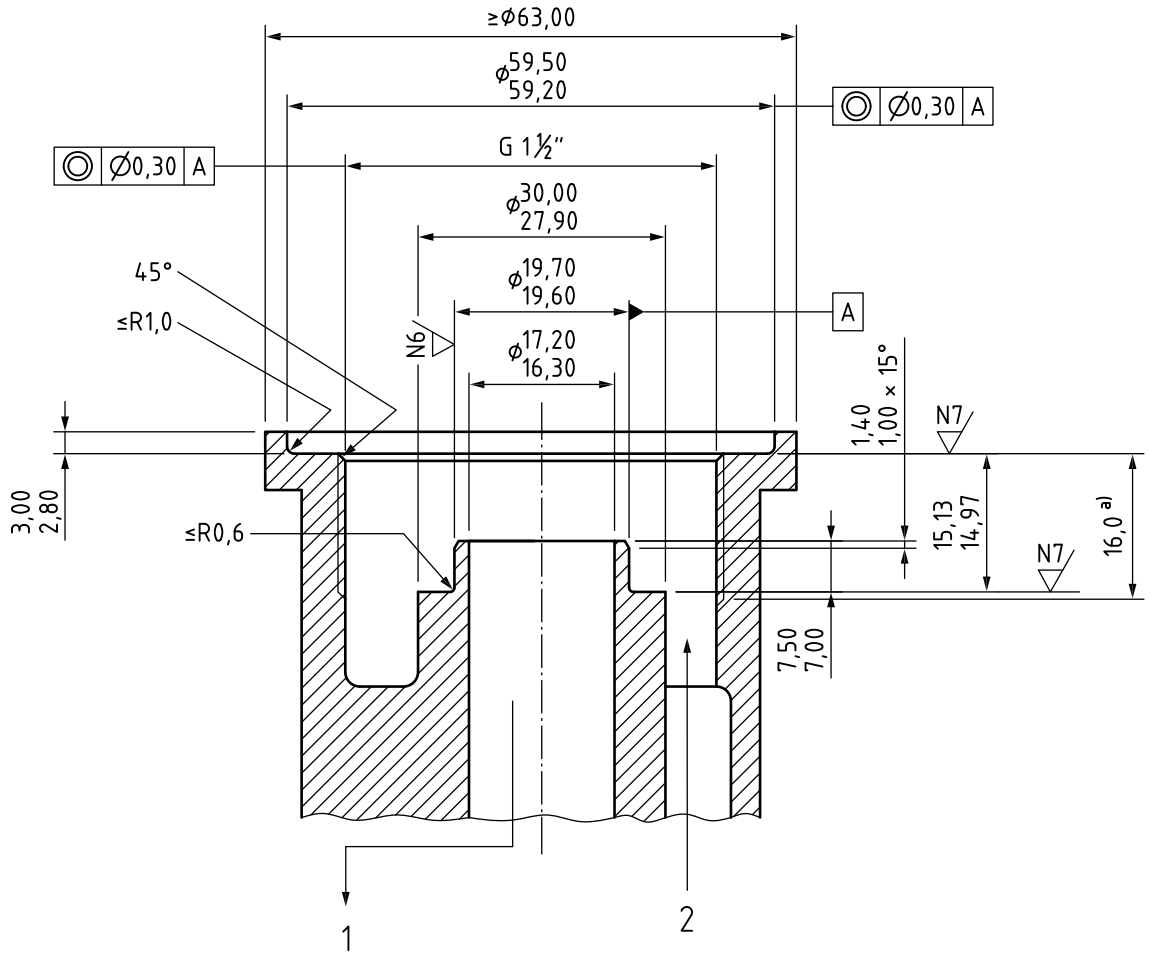
The manifold receptacle shall be manufactured in accordance with the dimensional requirements in Figure 5 or Figure 6.

8.7 Insulation plug

A close-fitting insulation plug tested in accordance with Annex I shall be included within the guard tube.

Figure 5 **Manifold dimensions – G 1½ concentric meters**

Dimensions in millimetres



Key

A Minimum, full thread

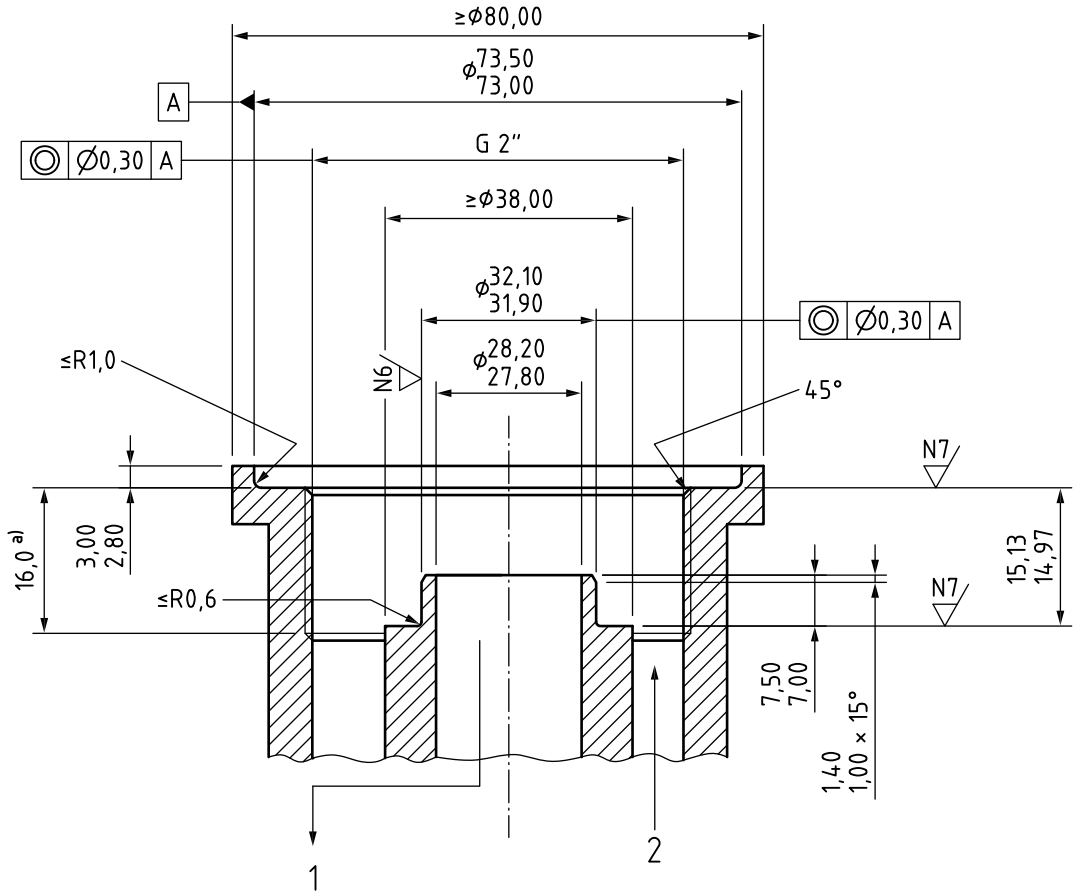
1 Water flow out

2 Water flow in

NOTE Reproduced from BS EN ISO 4064-4:2014.

Figure 6 **Manifold dimensions – G 2 concentric meters**

Dimensions in millimetres



Key

A Minimum, full thread

1 Water flow out

2 Water flow in

NOTE Reproduced from BS EN ISO 4064-4:2014.

8.8 Hydraulic head loss

8.8.1 G 1½ inch manifold

When tested in accordance with Annex F, the hydraulic head loss shall be not greater than 3 m^3 of water when the whole box assembly, fitted with a volumetric meter conforming to BS EN ISO 4064-2 and having a maximum permanent flow rate (Q_3) = 2.5 m^3/hr, is operating at a flow rate of 25 L/min. In defining the head loss the manufacturer shall identify the make of meter used in testing.

8.8.2 G 2 inch manifold

When tested in accordance with Annex F, the hydraulic head loss shall be not greater than 3 m^3 of water when the whole box assembly, fitted with a volumetric meter conforming to BS EN ISO 4064-2 and having a maximum permanent flow rate (Q_3) = 6.3 m^3/hr, is operating at a flow rate of 55 L/min. In defining the head loss the manufacturer shall identify the make of meter used in testing.

8.9 Product information

Suppliers shall produce a technical data file containing the following information as a minimum:

a) a category/application designation based on watertightness, design principle, load bearing capacity, inlet outlet connections and suitability for use in contaminated land as specified in **10.6**;

b) clear instructions on the recommended installation procedures including advice on backfilling and reinstatement requirements to obtain maximum structural performance of the box (see Annex A); and

c) a recommended maintenance statement giving full details of procedures, spare part schedules and any special tools or equipment necessary to permit the necessary and correct maintenance of the product throughout its minimum asset life (see Annex A).

9 Materials and effect on water quality

The design of components and the selection of the materials used in the construction of the boundary box shall take into account a 50 year design life, the normal situation of installation, and the conditions of use.

NOTE Attention is drawn to the following legislation for materials that are in contact with potable water: the Water Fittings Regulations [2 and 3], the Water Quality Regulations [4-7], and Private Water Supplies Regulations [8-11]. The specific legislation which applies in any circumstance will be dependent on where the fitting is to be used or the source(s) of the water supply. If in doubt contact the local water supplier or Local Authority's private water supply team (usually located within the Environmental Health teams) for advice.

10 Technical requirements of components

10.1 Surface box/cover and frame assembly

10.1.1 General

The integrated surface boxes of boundary boxes shall conform to BS 5834-2 and meet the load bearing in **8.2** when tested in accordance with Annex D.

10.1.2 Dimensions of surface box/cover or lid assembly

The dimensions of the access opening of the surface boxes (integrated or not) installed in connection with boundary boxes shall as a minimum allow the passage of a meter, the envelope dimensions of which are specified in BS EN ISO 4064-4.

NOTE The dimensions of the access opening of the surface box should be the minimum which permits ready access and adequate working width to perform the following possible activities:

a) install and retrieve the meter and meter blanking cap;

b) read the meter register easily;

c) operate, remove and/or maintain the control valve;

d) replace and/or maintain the check valve;

*e) install and retrieve any additional facilities listed in Note 2 to **10.3.3**; and*

f) install and retrieve any necessary insulation.

10.1.3 Angular adjustment

Where specified, integrated covers and frames shall be capable of adjustment to meet the slope of the surrounding surface independently of the main body of the box to a nominal 5° from horizontal. In all cases, rectangular covers shall have the additional facility of horizontal rotation.

10.2 Guard tube and insulation

NOTE The guard tube should:

a) locate the surface box/cover and frame assembly;

b) adequately support the external backfill material and withstand its loading;

c) considering the meter envelope specified in BS EN ISO 4064-2, provide adequate free working space to carry out operational, repair or maintenance work on the manifold assembly; and

d) provide space and location for the provision of insulating material to protect the meter and manifold from frost, condensation or possible damage.

When tested in accordance with Annex I, the insulation material shall show no signs of undue deformation or degradation and no amount of water absorption exceeding 10% of the original (dry) weight.

10.3 Manifold

10.3.1 Content

The boundary box shall contain a manifold conforming to **7.2**.

10.3.2 Fixation and sealing of manifold

The manifold shall be securely fixed to the base unit or guard tube so as to prevent any relative movement during installation, operation, subsequent maintenance or replacement work.

For Class 1 type boxes the inlet and outlet pipework connections through the base of the main body shall have watertight unions or seals when tested in accordance with Annex H.

When tested in accordance with Annex E the guard tube/base unit shall ensure that the immediate environment of the meter and manifold remains frost free, allowing water to be passed through the boundary box and the meter at a minimum pressure of 1 bar with the meter operating correctly and no visible signs of leakage from the manifold.

10.3.3 Meter receptacle

The meter receptacle for concentric meters shall be supplied with an appropriate removable blanking cap installed. This blanking cap, when in position, shall positively seal the orifice but shall not restrict the flow of water through the assembly.

Meter receptacles shall conform dimensionally to Figure 5 or Figure 6 depending upon the meter connection thread size, e.g. G 1½ " or G 2".

NOTE 1 Purchasers might request blanking caps which are not full-flow, e.g. trickle-flow or flow-isolation caps.

NOTE 2 By using special adaptors the meter receptacle can provide facilities, such as:

a) total flow isolation;

b) flow restriction;

c) sampling point; and

d) pressure measurement.

NOTE 3 A facility to secure the meter against tampering or illegal removal might be required.

NOTE 4 The purchaser should specify in their enquiry and/or order whether any or all of the additional features in Notes 2 and 3 are required.

10.3.4 Dewatering facility

Sufficient free volume shall be allowed below all manifold openings to receive any residual water discharge which may occur on removal of the meter.

NOTE A facility for dewatering the interior of the box at least to below the level of the manifold openings should be incorporated into the design.

10.3.5 Stop valve

A stop valve (stop tap) shall be incorporated into the manifold upstream of the meter and so positioned that repair or maintenance of the stop valve can be carried out in situ.

The stop valve shall conform to the requirements in the following standards:

a) stopvalves conforming to BS 5433 and/or WIS No. 4-23-04 [N1];

b) spherical plug valves conforming to WIS No. 4-23-04 [N1].

NOTE Other stop valves suitable for underground use and listed in the current edition of the Products and Materials Directory are considered appropriate.

10.3.6 Check valve

A check valve which conforms to BS EN 13959:2004, family E, type B, shall be incorporated into the downstream side of the meter and be so positioned that retrieval for maintenance and/or replacement can be carried out in situ.

10.3.7 Boundary box inlet/outlets

Inlet/outlet connections to the boundary box shall be provided in either of the following forms:

a) pipework tails; or

b) other connections/connector facilities.

NOTE 1 For example male or female threaded connection (¾ BSP), proprietary connectors to polyethylene service pipe or other service pipe materials (e.g. copper, lead, galvanized steel).

Where provided, inlet and outlet pipework tails shall be 25 mm or 32 mm SDR11 blue medium-density polyethylene (PE80) or high-density polyethylene (PE100) in accordance with BS EN 12201-1 and BS EN 12201-2; or other moulded tails dimensionally compatible with the above and conforming to **10.4**.

Where the pipework tails pass out through the base unit the design shall be such that the pipework is adequately located and held sufficiently firm to enable jointing of the tails to be carried out satisfactorily without undue movement.

NOTE 2 On completion of the installation work the design should ensure that the pipework is not subjected to any stress due to the loading on the boundary box cover and frame.

Where provided both inlet and outlet pipework shall extend a minimum of 150 mm outside the box.

Where connectors/connection facilities are installed, the boundary box shall conform to the appropriate British Standard, Water Industry Specification or an equivalent standard.

Inlet and outlet connection facilities shall have temporary plugs or caps fitted to maintain cleanliness during transportation and storage, which can be easily removed during installation.

10.4 Hydraulic pressure resistance

The manifold assembly with a blanking cap installed shall show no visible signs of leakage when tested in accordance with Annex G.

10.5 Base unit

10.5.1 Purpose

*COMMENTARY ON **10.5.1***

The base unit serves the following purposes:

a) provide a stabilizing platform for the boundary box;

b) provide a load distribution area if required; and

c) provide a housing for inlet/outlet tails/connections that permits any intended movement or flexibility to accommodate service pipe alignments and protects them against imposed loads from backfill or settlement.

10.5.2 Attachment

Where the base unit is not integral with the guard tube it shall be firmly located and securely attached thereto by a suitable corrosion-resistant jointing system.

10.6 Boundary boxes for use in contaminated land

When tested in accordance with BS 8588:2017, Annex B, boundary boxes intended for installation in contaminated land shall conform to **7.7**.

The test piece shall consist of:

a) the boundary box manifold assembled in the base unit, which may include a short section of guard tube (not exceeding 150 mm above the level of the meter receptacle);

b) a meter installed within the meter receptacle in the manifold;

c) the manufacturer's inlet/outlet connections or pipe tails attached to the manifold;

d) PE barrier pipe conforming to BS 8588 connected to the pipe tails via connectors conforming to BS 8588, or direct to the boundary box manufacturers inlet/outlet connections.

NOTE Whilst these test/performance requirements can determine the water containing components of the boundary boxes resistance to permeation, users should consider the risks associated with ingress of contaminated ground water into the boundary box when servicing the boundary box or meter exchange, etc.

11 Marking and labelling

Boundary boxes and, where applicable, their integrated surface boxes, guards and plinths shall be identified with the following information either marked indelibly on the product or supplied on a label attached to the product or packaging:

a) the manufacturer's name or trade mark/identification mark;

b) the number and year of this British Standard, i.e. BS 5834-1:2017 [1)];

c) the date of manufacture or batch code;

d) for concrete units, the identification of exposure conditions other than normal.

In addition, boundary boxes shall be marked on the product or supplied on a label attached to the product with the following information:

1) pressure rating (PFA 12.5 or PFA 16);

2) the direction of the flow through the boundary box;

3) the designation of the boundary box (see Clause **7**).

12 Type testing

Each design of boundary box shall be subjected to the following type tests:

a) (for class L) top loading test (Annex D);

b) freezing test (Annex E);

c) hydraulic performance: head loss test (Annex F);

d) hydraulic pressure test (Annex G);

e) (for class 1) watertightness test (Annex H); and

f) insulation material durability test (Annex I).

Initial type testing shall be undertaken to show conformity to Clauses **4** to **10**.

NOTE Tests previously performed in accordance with this standard (same product or specified, same characteristics, same method of sampling and same or more demanding test) may be taken into account.

Initial type testing shall also be undertaken:

1) at the start of production of a new type; and

2) whenever there is a significant change in design or method of manufacture.

The initial type test shall consist of taking samples in accordance with Annex C from the production line and subjecting them to the relevant test(s). To satisfy the requirements of the initial type test, all samples shall conform to Clauses **4** to **10**.

[1)] Marking BS 5834-1:2017 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 solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.

Annex A (informative) Information to be supplied by the purchaser

The following information regarding the product to be supplied should be agreed between the manufacturer and the purchaser.

a) Guards:

1) the dimensions required (see **6.2** and **6.3**);

2) the type of any concrete guard required (see **4.1.2**);

3) whether slots are required in vitrified clay guards (see **6.4**).

b) Plinths:

1) what type and size of guard the plinth is to support (see **4.2**);

2) utility apparatus to be housed (see **4.2.2**, Note 2);

3) the type of concrete plinth required (see **4.2.2**);

4) whether single or double channel concrete plinths are required (see **4.2.2**, Note 3).

c) Boundary boxes:

1) whether Watertightness Class 1: watertight or Class 2: non-watertight is required (see **7.1.3**);

2) whether Load-bearing L Grade A, B or C, or non-load bearing N is required (see **7.1.4**);

NOTE These designations can be met by boundary boxes with or without integrated surface boxes.

3) whether telescopic type with integral height adjustable facility T is required (**7.1.5**).

d) Generally:

1) whether vitrified clay or concrete units are required (see Clause **4**);

2) where concrete units are required, details of any exposure conditions more severe than the normal ones described in **5.2.6**.

Annex B (normative) Dimensional measurements of guards and plinths

B.1 Apparatus

B.1.1 *Steel measuring tape or retractable pocket rule*, conforming to BS 4484-1 with metric graduation and figuring each conforming to BS 4484-1.

B.1.2 *Outside spring calipers*, conforming to BS 3123.

NOTE At the manufacturer's discretion it is permissible to use purpose-made "go/no-go" steel gauges for dimensional measurements in lieu of the apparatus specified for the tests in this annex.

B.2 Guards

B.2.1 Internal dimensions

For circular bores, make three measurements of the internal diameter at each end of the guard or section at approximately 60° to each other.

For square bores, measure the width of each internal face approximately 50 mm from each end.

B.2.2 Wall thickness

For pipe guards, measure the wall thickness at approximately 50 mm from the upper end, at three positions equidistant around the circumference. For sections, measure the wall thickness at approximately 50 mm from the upper end, at the centre of each external face.

B.2.3 Size of slots

Measure the maximum vertical height and width at the base of each slot.

B.2.4 Length of pipe guard

Make three measurements of the external length of the guard at three positions equidistant around the circumference.

B.2.5 Height of sections

Measure the external height of the section at the centre of each external face.

B.3 Vitrified clay plinths

B.3.1 Diameter

Make three measurements of the external diameter of the unit at approximately 60° to each other. Repeat the procedure for the raised central portion.

B.3.2 Thickness

Measure the thickness of the raised central portion of the plinth at three positions equidistant around its circumference. Repeat the procedure for the thickness of the annulus, at three positions equidistant around the rim of the external circumference.

B.4 Concrete plinths

B.4.1 Seating dimensions (see Figure 4)

For slab type units and through-channel type units to suit sectional guards, measure the internal seating width, *D*, along each of the four sides and the depth, *B*, and thickness of the seating at each end of the internal width. For slab type units measure the width, *E*, of the gap in the seatings on all four sides. For through-channel type units to suit pipe guards measure the diameter, *F*, of the recessed seating at three positions equidistant around its circumference, the minimum distance between the recess and the edge of the plinth at each side of the channel and the depth, *B*, of the seating at that point.

B.4.2 Minimum thickness

For slab type plinths measure the minimum thickness at the centre of each of the four gaps in the seating. For through-channel type plinths measure the depth below each channel end.

Annex C (normative) Sampling procedures for inspection of finished products

Sampling for inspection of finished products shall be in accordance with Table C.1.

Table C.1 **Sampling procedures**

Clause	Test where specified	Initial type test	Routine inspection
5.1 and **5.2.4**	Visual inspection of finish	Every tested unit	Every tested unit
6.1 to **6.4** and **6.6**	Dimensions	3 N	3 Y
6.5	Straightness of pipe guards	3 N	3 Y

*NOTE Symbols are defined in **3.2.***

Annex D (normative) Surface loading test for load-bearing plastic guards and Class L boundary boxes: type tests

D.1 General

NOTE 1 These tests can be used to assess the resistance of boundary box assemblies to surface loading. The tests are designed to monitor the deformation of the box.

All surface boxes intended for use with boundary box assemblies shall be load tested in accordance with BS 5834-2.

NOTE 2 Surface boxes that specifically adapt/connect to boundary box guard tubes may be tested under conditions of support equivalent to that connection to the boundary box guard tube.

D.2 Surface loading test for class L boundary boxes

D.2.1 Apparatus

D.2.1.1 *Bearing blocks*, whose dimensions are (a) at least as great as the top of the guard tube of the boundary box to be tested, and (b) greater than the base unit of the boundary box, faced with hard rubber or other resilient material, and sufficiently rigid to ensure that the load is distributed evenly over each load-bearing surface of the box.

D.2.1.2 *A device for applying the load*, capable of applying a load at least 25% greater than the appropriate load specified in Table 1. The device shall be accurate to within 2% of the indicated load.

D.2.1.3 *A measuring device*, suitable for indicating deflection measurements to within ±0.5 mm.

D.2.2 Preparation of test samples

The boxes shall be tested in the following manner:

a) **Class L boundary box:** The complete assembly shall be tested at the manufacturer's maximum declared height. This height shall be declared in the test report (see **D.3**).

NOTE If a range of heights of boundary boxes are declared, the manufacturer should test at each specified individual height.

b) **Telescopic type T boundary box**: The complete assembly shall be tested between the two bearing blocks and show no signs of permanent deformation or cracking. Where the height adjustment facility includes the use of rigid spacers, the complete assembly shall be tested with the number of these spacers required to establish the required maximum manufacturer's declared height. This height shall be declared in the test report (see **D.3**).

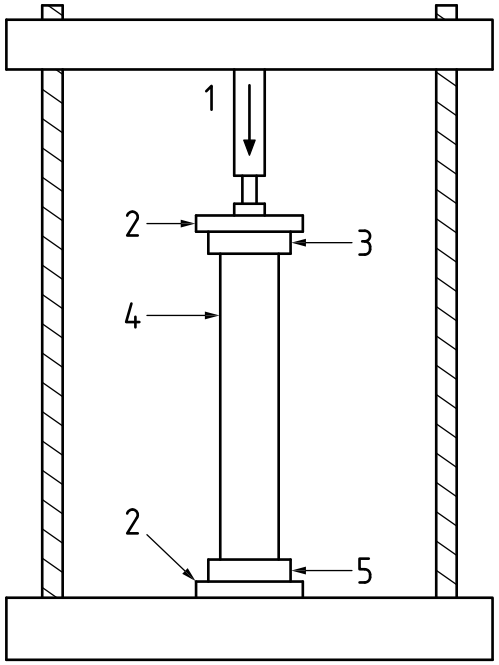
D.2.3 Procedure

Place the complete boundary box assembly vertically between the two bearing blocks (see Figure D.1).

Apply a bedding-in load of 1/3 the appropriate test load for a period of 30 s (see Table D.1) and then remove it.

Apply the Grade A, B or C (see Table D.1) test load at a rate of 1 kN/s to 5 kN/s and sustain the load for a period of 30 s. During the load application period, monitor any axial deformation of the assembly and record it. After removal of the test load, examine the assembly for any visible cracking and record it.

Figure D.1 **Integrated surface box**



Key

1	Applied load	4	Guard tube
2	Bearing block	5	Base
3	Surface box		

Table D.1 **Test loads for top-load test as defined in Annex D**

Design load (Grade A) kN	**Design load (Grade B)** kN	**Design load (Grade C)** kN
$350\times\frac{a}{70686}\times 1.3$	$\frac{150\times a\times 1.3}{70686}$	$10\times\frac{a}{70686}$ or 5 kN whichever is greater

NOTE For integrated surface boxes, "a" is the total top surface area of the cover/lid. For boundary boxes without integrated surface box, "a" is the total surface area of top form including any internal voids.

D.3 Test report

The test report shall include:

a) the full identification of the specimen;

b) description of fitting assembly;

c) test conditions;

d) observations and results; and

e) the date of the test.

Annex E (normative) Freezing: type test

E.1 Principle

To simulate the ground conditions during a prolonged surface frost to provide assurance of a boundary box's resistance to freezing.

E.2 Apparatus

E.2.1 *Insulated chamber*, having sufficient depth and base area in order to contain a boundary box installed in representative ground material (backfill), the depth of the ground material to be a minimum of 1 500 mm. The chamber also encloses an air space above the level surface of boundary box cover and ground material. The chamber shall be designed to be capable of maintaining a temperature profile as specified in **E.3**.

E.2.2 *A suitable freezer unit*, with its low temperature unit installed in the air space of the insulated chamber, capable of reducing the temperature at ground level to a minimum of –15 °C.

E.2.3 *Temperature measuring devices*, capable of measuring the temperature of the surrounding backfill of the boundary box to an accuracy of ±0.25 °C.

E.3 Procedure

Install an approved meter inside the boundary box. Fill the manifold, meter and service pipe tailwork with water and blank off the service pipe tailwork or inlet/outlet terminations prior to installation.

Install the boundary box in the insulated chamber such that the boundary box cover is level with the backfill material when installed and such that the depth of backfill is a minimum of 1 500 mm. Insert temperature probes at 300 mm and 1 000 mm below the ground level and at a distance of 50 mm from the boundary box. Backfill the chamber and place the low temperature unit of the freezer in the air space above the boundary box.

Test a self-draining boundary box empty, and fill it with water to a depth of:

a) half way up the meter; and

b) full boundary box height.

Lower the temperature of the surrounding backfill by adjustment of the freezer unit and maintain until stable temperatures of (0 ±1) °C and (4 ±1) °C are obtained at 300 mm and 1 000 mm depth respectively.

Maintain this temperature for 2 weeks.

Lower the ground level temperature to (–13 ±1) °C and maintain for 3 days.

Remove the freezer unit and inspect the box for signs of freezing.

At the end of the 3 day period, remove the boundary box from the insulated chamber and pressurize the inlet connection or tail to a maximum pressure of 1 bar, and observe if it flows through the manifold and meter.

Subject the manifold assembly to a hydraulic pressure test in accordance with Annex G and observe for any signs of leakage.

E.4 Test report

The test report shall include:

a) the full identification of the specimens;

b) description of fitting assembly;

c) test conditions;

d) observations – the test shall be recorded as pass or fail; and

e) the date of the test.

Annex F (normative) Hydraulic performance head loss: type test

F.1 Principle

This test, based on BS EN 14154-3:2005+A2:2011, for measuring flow in single meters to assess the hydraulic efficiency of a boundary box.

F.2 Apparatus

F.2.1 *A pump*, capable of providing hydraulic flow-rates between 5 and 60 L/min.

F.2.2 *Pressure gauges*, capable of connection to the inlet and outlet pipes as specified in BS EN ISO 4064-4.

F.2.3 *Service pipe*, of a size and quality for which the unit is designed, to which the inlet/outlet connections of the boundary box are made and on which the pressure tappings are made.

F.3 Procedure

The test shall be conducted in accordance with the procedure described in BS EN ISO 4064-4 using suitably accredited equipment. The static differential pressure ($\triangle P_2$) is measured at the selected flow rate between the pressure tappings of the measuring section assembled with the boundary box. The measurements are repeated for the same pipe at the same flow-rate in the absence of the boundary box ($\triangle P_2$).

The actual headloss due to the fitting is given by:

$$\triangle P = \triangle P_2 - \triangle P_1$$

F.4 Test report

The test report shall include:

a) the full identification of the specimens and make of meter used;

b) description of fitting assembly including meter;

c) test conditions (including flow rates);

d) the headloss due to the boundary box in metres; and

e) the date of the test.

Annex G (normative) Hydraulic pressure: type test/quality control test

G.1 General

This test, based on BS EN ISO 3458 and BS EN ISO 3459 for assembled joints between fittings and polyethylene pressure pipes, can be used to assess the leaktightness of a boundary box when subjected to (a) internal hydrostatic pressure and (b) internal vacuum.

G.2 Apparatus

G.2.1 *A suitable pressure source*, capable of being connected to the assembled test specimen and holding the specified test pressure to an accuracy of ±2%.

G.2.2 *A pressure gauge*, for checking the applied pressure.

G.3 Procedure

G.3.1 General

The boundary box assembly shall include an approved meter. The dimensions of the connecting threads shall be checked for conformity to BS EN ISO 4064-4.

The inlet of the boundary box shall be connected to the pressure source. The outlet shall be sealed off.

G.3.2 Internal hydrostatic pressure type test

Apply an internal hydrostatic pressure of 1.5 × PFA for a min of 1 h and inspect the assembly for any sign of leakage.

The test shall be declared satisfactory if no leakage occurs during the test.

G.3.3 Negative internal pressure type test

The internal vacuum test shall be carried out at two levels of pressure difference between the external and internal pressures of 0.01 MPa and 0.08 MPa (0.1 bar and 0.8 bar). Apply the initial pressure for 1 h, increase the pressure differential and hold for a further 1 h.

The test shall be declared satisfactory if no leakage occurs during the test.

G.4 Test report

The test report shall include:

a) the full identification of the specimens;

b) description of fitting assembly;

c) test conditions;

d) observations and results; and

e) the date of the test.

Annex H (normative) Water tightness: type tests

H.1 Principle

To assess the water tightness of Class 1 boxes.

H.2 Apparatus

H.2.1 *Water tank,* capable of submerging the boundary box completely.

H.2.2 A means of holding the box at the specified level in the tank.

H.3 Procedure

Assemble the boundary box in the vertical position. For the purpose of this test, it is acceptable to replace the meter with a meter blanking plate. Keep the pipework and manifold free from water and the inlet and outlet sealed to prevent contamination.

H.4 Type test

The complete assembly shall be submerged, using the apparatus specified in **H.2.2**, in water at ambient temperature for 30 days and monitored for any visible signs of water ingress into the boundary box.

H.5 Test report

The test report shall include:

a) the full identification of the specimens;

b) a description of fitting assembly;

c) test conditions;

d) observations; and

e) the date of the test.

Annex I (normative) Insulation material durability: type test

I.1 General

To assess the durability of the insulation material, where supplied.

I.2 Procedure

Withdraw the insulation material from, and reposition it within, the box. Repeat for a minimum of 500 cycles.

Check that the insulation material shows no signs of undue deformation or degradation.

Weigh the insulation material, and then completely submerged it in water for 15 min. Then, re-weigh the material following removal from the water. The difference between the two readings shall not exceed 10% of the original (dry) weight.

I.3 Test report

The test report shall include:

a) the full identification of the specimen;

b) test conditions;

c) observations – the results shall be recorded as pass or fail; and

d) the date of the test.

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