

# Selection and installation of plastic inspection chambers for underground drain and sewer systems

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**Note:** Images and diagrams used in this document are for illustrative purposes only.

## Introduction

Inspection chambers and manholes are an integral part of all drain and sewer systems to facilitate safe and easy access for testing, inspection, maintenance and removal of debris.

Plastic inspection chambers have been widely used for many years in the UK and provide a means of access compatible with the aims of the Confined Spaces Regulations 1997 to carry out cleaning and inspection operations without entering the confined space.

**The purpose of this guide is to provide information on the key features of plastic inspection chambers, the choice of products and suitability for use in any given application or loading situation, together with practical design and installation tips.**

The use of the correct standard for purchasing products suitable for their intended application ensures ease of installation and a long service life. Information on specifications can be found in the latest edition of the BPF Pipes Group guidance. *"Specifications for plastic pipes, chambers, manholes and covers for drainage and sewerage applications"*.





**Note:** Plastic manholes in sizes up to three metres were introduced in 1967 to offer a pre-fabricated, one-piece unit as an alternative to traditional concrete ring systems. Plastic manholes are not covered by this guide and a separate guide is planned. However, typical details for plastic manholes are included in the [Sewerage Sector Guidance, Appendix C Design and Construction Guidance](#)



## Construction of drains and sewers in the UK

Table 1: Key documents for construction of drains and sewers in the UK

(Source: Specifications for plastic pipes, chambers, manholes and covers for drains and sewers)

|                  | Drain   | Public Sewer  |   |
|------------------|---|---|---|
| England          | Building Regulations: Part H<br>Approved Document H   | <a href="#">Design and Construction Guidance</a>  |    |
| Northern Ireland | Building Regulations: Part N  | <a href="#">Sewers for Adoption – Northern Ireland (1st edition), referred to as SFA-NI</a> |   |
| Scotland         | Building Standards: Part M.<br>Technical Handbook – Domestic:<br>Environment<br>Technical Handbook - Non-Domestic:<br>Environment | <a href="#">Sewers for Scotland (4th edition), referred to as SfS4</a>                      |  |
| Wales            | Building Regulations: Part H<br>Approved Document H   | <a href="#">Sewers for Adoption (7th Edition), referred to as SFA7</a>                      |  |

In addition, BS EN 752: 2017 provides a framework for the design, construction, maintenance, operation and rehabilitation of drain and sewer systems outside buildings. The UK National Annex to this standard provides additional information to assist users in the application of the standards locally.

## Access points

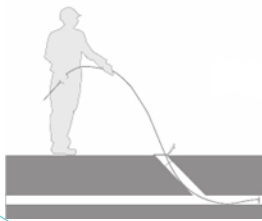
### What is an access point?

An access point is the means to access a sewer or drain for testing, inspection, maintenance and removal of debris.

The National Annex to BS EN 752: 2017 describes four means of accessing drains and sewers without the need to enter a building. The Design and Construction Guidance (DCG) uses the same descriptions.

#### **Rodding Points**

Small diameter connections at the upstream end of a drain or sewer that permit entry into the system for cleaning or inspection downstream of the connection.



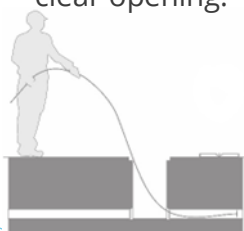
#### **Manholes**

Chambers with working space at drain / sewer level used for entry of personnel and equipment for testing, inspection and maintenance.



#### **Inspection Chambers**

Chambers with working space at ground level only, used to introduce equipment for testing, inspection and maintenance. The working space in a chamber normally permits additional operations to those carried out through an access fitting, such as removal of debris using suction hoses and over-pumping from one chamber to another. Depending on local building regulations and the depth of the chamber there can be restriction placed on the clear opening.



#### **Access Fittings**

Fittings that are normally located near the upstream end of a drain or sewer and permit entry into the system for cleaning or inspection. The restricted access offered by these fittings means that operations such as removal of debris using suction hoses is not possible.

## Where are the access points required for operations?

**For drains** - the Building Regulations for England, Wales and Northern Ireland require an access point at any change of direction in the drain, any change in gradient, and any change in pipe diameter. It is also normal to specify an access point at the head of the drain. Access points which serve more than one property need to be located such that they are both accessible and visible to contractors not employed by the property owner and for ease of access and operations in case of an emergency. Table 2 sets out the provisions for access in the key documents for construction of drains in the UK.

**Table 2: Requirements for access points for drains in key documents**

| Position Access Point Is Required                                 | Requirements                              |   |  |   | Best Practice Guidance           |
|---|---|---|--|---|----------------------------------|
|   | Building Regulations: Approved Document H | Northern Ireland Building Regulations: Technical Book N | Building Regulations Scotland Technical Handbook – Domestic: Environment | Building Regulations Scotland Technical Handbook – Non-Domestic: Environment* | National Annex to BS EN 752:2017 |
| Change of alignment (Change of direction)                         | Yes                                       | Yes   | Not specified  | Not specified   | Yes                              |
| Change of gradient  | Yes                                       | Yes   | Not specified  | Not specified   | Yes                              |
| Head of the sewer   | Not specified                             | Yes   | Not specified  | Not specified   | Not specified                    |
| Junction of 2 or more public sewers                               | Not specified                             | Not specified   | Not specified  | Not specified   | Yes                              |
| Change of pipe diameter   | Yes                                       | Yes   | Not specified  | Not specified   | Yes                              |
| At the head of the drain  | Yes                                       | Yes   | Not specified  | Not specified   | Yes                              |
| Within 12m of the connection to a sewer unless access is provided | Not specified                             | Yes   | Not specified  | Not specified   | Yes                              |
| Where private drain discharges into a public sewer                | Not specified                             | Not specified   | Yes  | Yes   | Not specified                    |

*\* Building Regulations Scotland Technical Handbooks: Domestic and Non-Domestic both specify that drainage systems should be constructed in accordance with BS EN 752:2008. Now that BS EN 752:2017 is available installers should use this standard instead as it is the more up to date document.*

**For public sewers** - all UK water companies require an access point at any change of direction in the sewer, any change in gradient, any change in pipe diameter and at connections between two or more sewers. Additionally, an access point is required between the water company's sewer and any private sewer or drain - the type of access point will depend on the number of properties being served. The water company may also insist upon a demarcation chamber at the boundary of a property.

Table 3 sets out the provisions for access in the key documents for construction of sewers in the UK.

**Table 3: Requirements for access points for public sewers in documents**

| Position Access Point Is Required  | Requirements                    |                                  |                                   |  | Best Practice Guidance            |
|--|---------------------------------|----------------------------------|-----------------------------------|--|-----------------------------------|
|  | Sewers for Adoption 7th Edition | Design and Construction Guidance | Sewers for Scotland (4th edition) | Sewers for Adoption-Northern Ireland (1st edition) | National Annex to BS EN 752: 2017 |
| Change of alignment (Change of direction)  | Yes                             | Yes                              | Yes                               | Yes  | Yes                               |
| Change of gradient   | Yes                             | Yes                              | Yes                               | Yes  | Yes                               |
| Junction of 2 or more public sewers  | Yes                             | Yes                              | Yes                               | Yes  | Yes                               |
| Change of pipe diameter  | Yes                             | Yes                              | Yes                               | Yes  | Yes                               |
| At the head of the drain   | Not specified                   | Yes                              | Not specified                     | Not specified                                      | Yes                               |
| Within 12m of the connection to a sewer unless access is provided  | Not specified                   | Not specified                    | Not specified                     | Not specified                                      | Yes                               |
| Pipe material  | Yes                             | Not specified                    | Not specified                     | Yes  | Not specified                     |
| At every junction of a public sewer with another sewer serving three or more properties (Note for more than 10 properties access is through a manhole) | Yes                             | Yes                              | Not specified                     | Yes  | Not specified                     |
| At or within 1m of the property boundary at the upstream end of each lateral drain (preferably inside the property boundary)                           | Yes                             | Yes                              | Not specified                     | Not specified                                      | Not specified                     |
| Where private drain discharges into a public sewer   | Yes                             | Yes                              | Yes                               | Not specified                                      | Not specified                     |

### How many access points are needed?

The maximum spacing between access points is determined by the type of operations to be carried out from that access point. Once access points have been designed into the drain or sewer system, to satisfy the requirements of the key documents (See Table 2 and 3), guidance in the National Annex to BS EN 752: 2017 can be used to identify the maximum spacing.

**Table 4: Recommended maximum spacing of access provision (in metres)**

*(Source: BS EN 752: 2017 Table NA.4)*

|   | To Junction / Branch | To Access Fitting | To Inspection Chamber | To Manhole      |
|---|----------------------|-------------------|-----------------------|-----------------|
| From start of external drain  |                      | 12                | 22                    | 45              |
| From rodding point  | 12                   | 12                | 22                    | 45              |
| From access fitting   | 12                   | 12                | 22                    | 45              |
| From inspection chamber   | 12                   | 22                | 45                    | 45              |
| From manhole  |                      |                   | 45                    | 90 <sup>a</sup> |
| <sup>a</sup> This may be increased to 200m in places where only remotely operated equipment will be used for maintenance. |                      |                   |                       |                 |

Traditionally several of the key UK documents have been inconsistent in the approach to the maximum spacing of access. The update to the National Annex of BS EN 752 seeks to rectify this by providing clear and logical recommendations.

The Design and Construction Guidance (DCG) is aligned to the National Annex and it is anticipated that, as the remaining UK documents are updated, they too will align with BS EN 752: 2017.

### What type of access points are needed for safe working?

UK Regulation and best practice guidance promote a strong preference to working at ground level.

#### **BS EN 752: 2017**

*"Wherever possible, provisions should be made for work to be carried out from surface level."*

#### **The Confined Spaces Regulations 1997**

*"No person at work shall enter a confined space to carry out work for any purpose unless it is not reasonably practicable to achieve that purpose without such entry."*

#### **Scotland Building Standards Domestic and Non-Domestic Handbooks**

*"Health and safety legislation requires that manual entry to a drain or sewer system is only undertaken where no alternative exists."*

*Therefore use of remotely operated equipment will become the normal method of access. As well as the traditional inspection chambers used for depths of up to 1m, remotely operated equipment is available for inspection, cleaning and removal of debris from deeper drains and sewers, without the need for personal entry."*

Compliance with this safe working practice can, in many cases, be achieved by using chambers in preference to manholes.

Depending on the depth of installation, inspection chambers may require the clear opening to be restricted to 350mm. This is to avoid accidental access (for example a child falling) with no means of egress.

Note: The latest revision of standard BS EN 13598-2 accommodates practice from across Europe and therefore includes the use of chambers to depths of six metres. UK Regulation and best practice should be followed. For practical reasons, manholes are typically provided for depths of more than three metres due to problems with controlling equipment in deep / narrow chambers. Manholes might also be preferred for large incoming pipes to facilitate access for the type of equipment needed to clean pipes of this size or where a high level of, or complex, maintenance might be required.

## Inspection chambers

### Specification

The use of the correct standard for purchasing products which are suitable for their intended application ensures ease of installation and a long service life.

BS EN 13598-1: 2020 (*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 and shallow chambers*) is limited to chambers on private drains in well-defined locations, to chambers located above the ground water table and to a maximum invert depth of 2m.

BS EN 13598-2: 2020 (*Plastics piping systems for non-pressure underground drainage and sewerage. Unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE). Specifications for manholes and inspection chambers*) covers chambers for all locations.

Information on specifications can be found in the latest edition of the BPF Pipes Group guide "*Specifications for plastic pipes, chambers, manholes and covers for drainage and sewerage applications.*"

Plastic chambers are designed such that any vehicular loading on the chamber cover is not transmitted to the chamber components. The surface unit (cover and frame) is disconnected from the chamber riser shaft. Unlike covers and frames, plastic chambers to BS EN 13598 are therefore not classified according to expected traffic loading. Further guidance on covers and frames can be found later in this guidance note.

### Installation

Care when installing plastic chambers will ensure optimum performance and maximum longevity of products. Best practice guidance is contained in several standards and guidance documents. This is brought together here, with reference to further details where appropriate.

### Use in brownfield sites

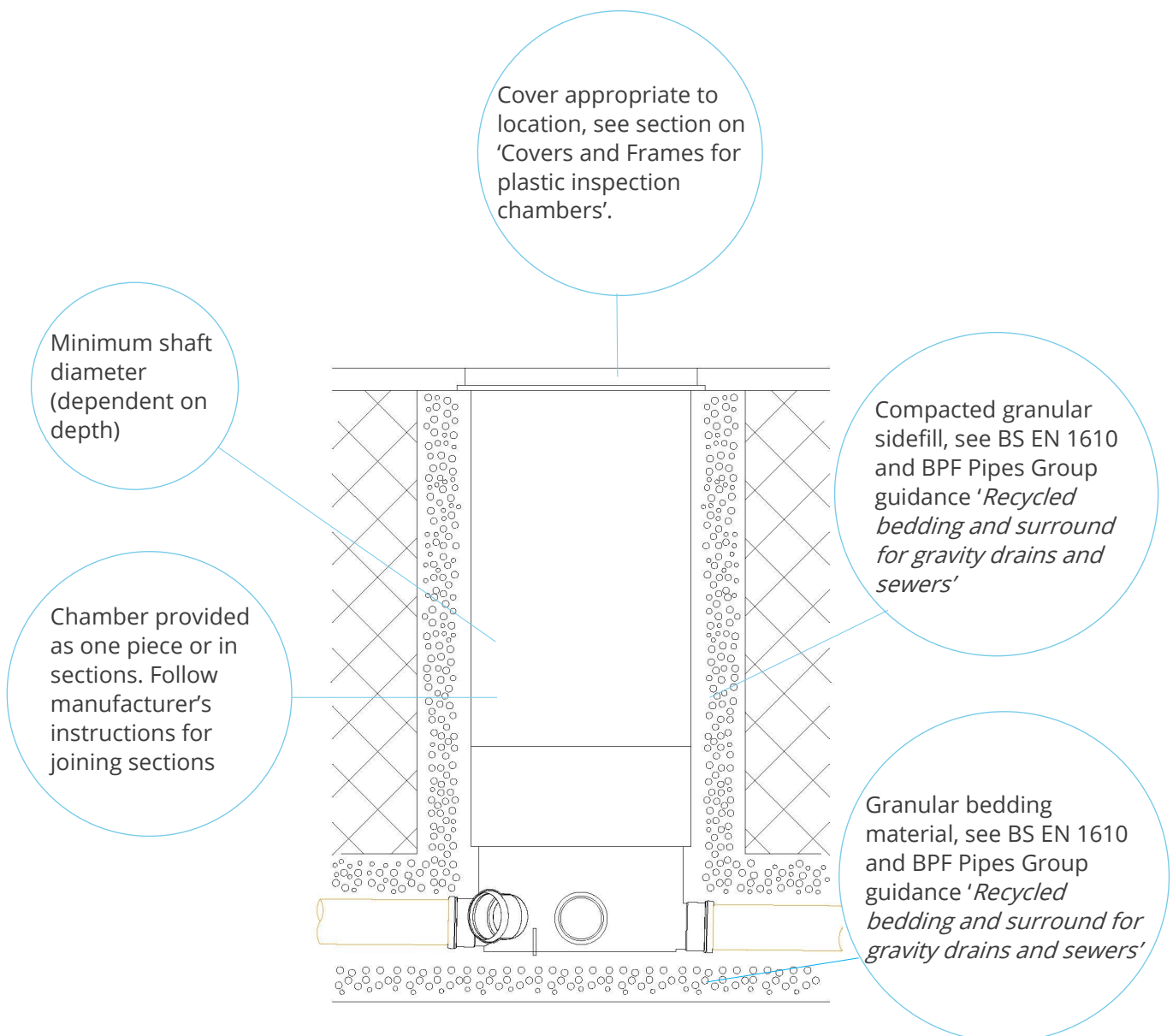
Plastic chambers are, in most cases, suitable for use on both brownfield and greenfield sites. The BPF Pipes Group has developed guidance notes for pipeline designers selecting and installing drains and sewers in these situations "*Designing drains and sewers for brownfield sites.*"

## Chamber components

Plastic chambers can be supplied as an assembly or as separate components. The components are shown in Figure 1 and 2.

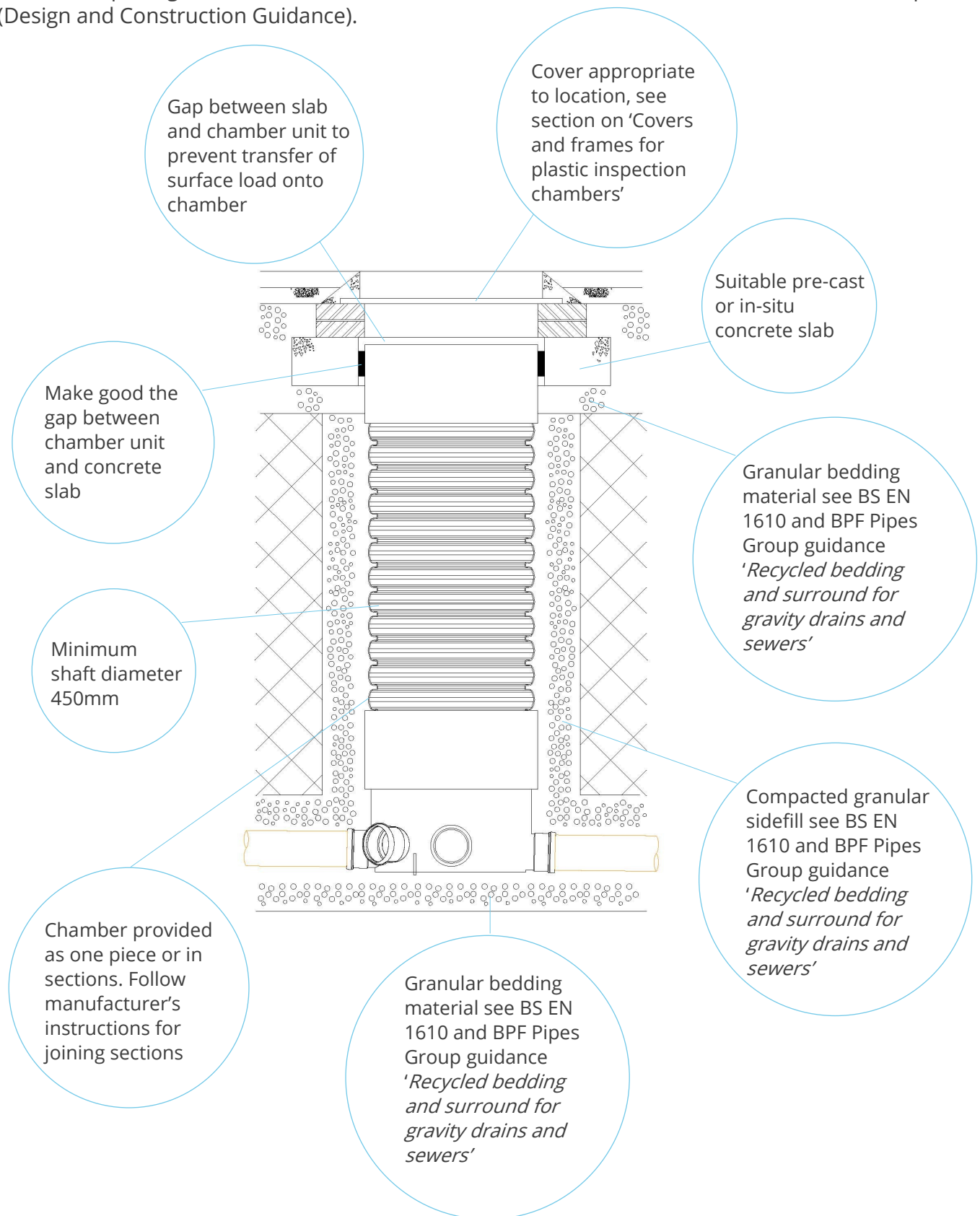
### **Figure 1: Plastic inspection chamber designed for use in drains**

Minimum opening size—restricted to 350mm diameter or 300mm x 300mm above 1.0 m deep (Design and Construction Guidance) or 1.2m deep (Approved Document H).



**Figure 2: Plastic inspection chamber designed for use in public sewers**

Minimum opening size—restricted to 350mm diameter or 300mm x 300mm above 1.0 m deep  
(Design and Construction Guidance).



## Internal Layout

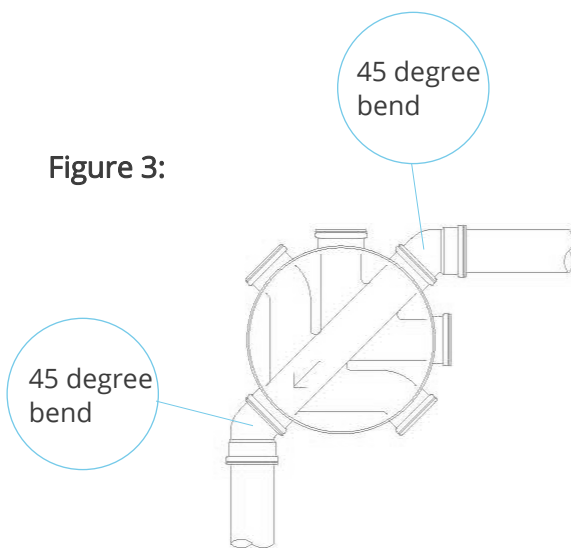
To minimise blockages and ease maintenance operations, it is recommended that:

- The correct size/capacity chamber is selected based on the depth and number of inlets (consult manufacturer's literature).
- The main channel extends along the whole diameter of the chamber.
- The main channel is always aligned to take the highest discharge flow.
- Branches should enter the main channel discharging in the direction of flow at an angle of no more than 45° to the main flow.
- Bends immediately outside inspection chambers on the inlet, the outlet or both pipes should not be greater than 45°.

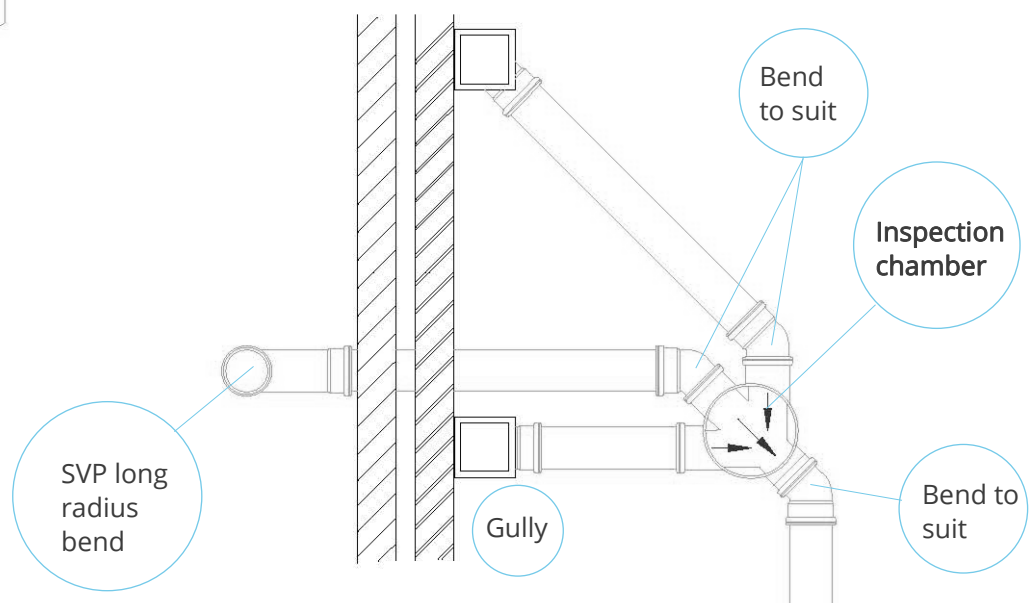
Figures 3 and 4 illustrate the internal layout.

Further detail is provided in clause NA.6.4.4.3 of BS EN 752: 2017.

**Figure 3:**



**Figure 4:**



### Suitable bedding and backfill materials

Bedding and surround materials are typically the same as that used for the connecting pipework. It is recommended that:

- Maximum particle sizes as given in BS EN 1610: 2015 Clause 5.2.1 by pipe diameter
  - 22mm for DN < 200mm; 40mm for DN > 200mm DN < 600mm; 60mm for DN > 600mm
- Where recycled aggregate is used, the EA / NIEA / WRAP Quality Protocol "*Aggregates from Inert Waste*" is followed. Further guidance is provided in the BPF Pipes Group guide "*Recycled bedding and surround materials for gravity drains and sewers.*"

### Construction

It is recommended that construction is carried out to BS EN 1610: 2015. Key aspects for construction of plastic chambers:

- Prepare and compact 100mm bed of 'as dug' or granular material in trench bottom.
- Install chamber base onto bed and use standard jointing sequence to connect 110mm / 150mm pipes in turn to inlets / outlets.
- Install and compact side fill up to top of pipes and/or to near the top of the chamber base. This is to assist in the stability of the base when installing the shafts.
- Install chamber shaft / shafts in accordance with manufacturer's instructions.
- Install and compact side fill to shafts in layers, ensuring that compaction does not displace or deform the shafts.
- Most elements are lightweight and can be handled / installed by 1 or 2 people.

## Covers and frames for plastic inspection chambers

Product Specifications:

BS EN 124-6 - Gully tops and manhole tops for vehicular and pedestrian areas. Gully tops and manhole tops made of polypropylene (PP), polyethylene (PE) or unplasticized poly(vinyl chloride) (PVC-U).

**Note:** intended places of installation are referenced in EN 124-1 - Gully tops and manhole tops for vehicular and pedestrian areas. Definitions, classification, general principles of design, performance requirements and test methods.

BS ISO 15398 - Specifications for thermoplastics covers and frames for manholes and inspection chambers used in non-traffic areas.

## Selection

For use in applications which are not in the highway, covers for plastic chambers should be selected to ensure they are suitable for the loading characteristics of the place of installation.

The intended places of installation are grouped for the purpose of identification in EN 124-1, also referenced in NHBC Standards, and BS ISO 15398.

Group 1 – Areas which can only be used by pedestrians and pedal cyclists

Group 2 – Footways, pedestrian areas and comparable areas, car parks or car parking decks (areas not accessible by lorries or other heavy goods vehicles)

For each group there is a minimum loading classification:

Group 1 – A 15 (based on a 15kN load test).

Group 2 – B 125 (based on a 125kN load test).

In addition, BS ISO 15398 includes the following category:

A group which is private household driveways not part of the public highway with loading class A 35 (based on a 35kN loading test). BPF Pipes Group recommend the following additional guidance for Class A 35:

- Private single household driveways which are not part of the road network. They are designed for occasional use only and should not be parked on. Therefore, it is necessary that they are installed outside of the line of drive and not in an area where vehicles turn as turning can generate higher wheel forces and point loads.
- Large commercial delivery vehicles, municipal refuse vehicles or similar can generate higher loading and therefore if there is a risk of larger vehicles entering the driveway a B 125 cover should be used. Driveway entrances can often be used for turning by larger vehicles, if this is likely to occur a B 125 cover should be used here also. These vehicles can generate a wheel loading greater than 35kN, particularly if the wheels have turned or braked on the cover, as this may exert forces in excess of the design loading.
- For a driveway serving more than one property a load rating of at least 125kN is required.

Group 4 – carriageways of roads (including pedestrian streets), hard shoulders and parking areas, for all types of road vehicles, e.g. highways, with a loading class of D 400 (based on a 400 kN load test).

For use in highway applications (area that includes some, or all, of the following features: carriageway, cycleway, footway, verge, hard shoulder, hard strip and central reservation under BS 7903: 2020) it is recommended that installation of covers is carried out to BS 7903: 2020. Further guidance can be found in the latest edition of the BPF Pipes Group guide “A guide to the selection and installation of covers for manholes and inspection chambers – BS 7903: 2020.”

## Installation

**Important! Correct installation of the cover and frame is essential to prevent failure of the cover.**

Key aspects for installation of covers for plastic chambers:

- Use components supplied with, or recommended for use with, the cover. Covers and frames, together with any gaskets, seatings and seals, are tested and supplied as a single unit to avoid a poor fit which could lead to noise from rocking of the cover in the frame or loss of the cover from the unit.
- Install covers and frames and any supporting structure in accordance with manufacturer's recommendations.
- Loading is transferred through the cover and frame to the supporting structure, typically a concrete slab or collar. For plastic chambers, the supporting structure (also called a 'near surface component') is used to spread the loading to the surroundings.
- Group 1 Class A 15 – the frame should always be installed with a concrete surround at least 150 mm wide x 150mm deep.
- Class A 35 - the frame should always be installed with a concrete surround at least 300mm wide x 225mm deep. On sloping driveways, the concrete should be extended upwards to surround the frame at ground level and no tarmac should be installed on top of the concrete.
- Group 2 Class B 125 - refer to manufacturer's instructions.
- **If the frame is not supported correctly on concrete, then the cover and frame will not perform as required.**
- Use bedding and packing materials in accordance with the manufacturer's recommendations to ensure that adequate support is provided by the bedding to the frame at all contact points.
- Position the cover to the final surface level.
- Protect the cover and frame from any additional loading during the construction period (e.g. from site traffic) and possible damage prior to surfacing the road or driveway.

## Leaktightness of systems

Plastic chambers to BS EN 13598 are made from a prescribed set of components. The leaktightness of all connections between the components of a plastic chamber and the joints to inlet and outlet pipework against exfiltration is included in BS EN 13598-1: 2020 and BS EN 13598-2: 2020. Testing of the whole unit is undertaken as part of the compliance testing to the standard.

Plastic chambers manufactured to BS EN 13598-1: 2020 are intended for use above the ground water table only. Part 1 does not therefore include a requirement or test for resistance to infiltration. Similarly, leaktightness testing of chambers on site is not required.

**Note:** If plastic chambers need to be watertight, even when used on private drains, products need to be specified to BS EN 13598-2: 2020.

Plastic chambers manufactured to BS EN 13598-2: 2020 are intended for use below the ground water table. The manufacturer will test the resistance to infiltration and declare the maximum allowable height of ground water which can be accommodated.

Plastic chambers may be supplied to site as a single unit or a set of components for site assembly. The final leaktightness performance of the system is dependent on the quality of construction work - it is important to follow the manufacturer's installation guidance and take care during jointing to pipework to ensure a good seal is made.

No additional testing for water tightness after construction is required by the key UK documents (see Table 1). However, visual inspection is undertaken to check the final installed system is watertight with no identifiable flow of water penetrating the chamber.

## Bibliography

**BS 7903** Selection and installation of manhole tops and gully tops within the highway. Guide. BSI, 2020.

**BS EN 124-1** Gully tops and manhole tops for vehicular and pedestrian areas. Definitions, classification, general principles of design, performance requirements and test methods. BSI, 2015.

**BS EN 752** Drain and sewer systems outside buildings. Sewer system management (incorporating corrigenda October 2019) BSI, October 2019.

**BS EN 1610** Construction and testing of drains and sewers. BSI, 2015.

**BS EN 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 and shallow chambers. BSI, 2020.

**BS EN 13598-2** Plastics piping systems for non-pressure underground drainage and sewerage. Unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE). Specifications for manholes and inspection chambers. BSI, 2020.

**BS ISO 15938** Specifications for thermoplastics covers and frames for manholes and inspection chambers used in non-traffic areas. BSI, 2012.

Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code"). Approved Version 2.1 25 May 2021.

[NHBC Standards](#)



BPF Pipes Group guidance (available from website):

- *Specification for plastic pipes, chambers, manholes and covers for drainage and sewers application*
- *Designing drains and sewers for brownfield sites*
- *Recycled bedding and surround for gravity drains and sewers*

A list of members who manufacture and supply plastic inspection chambers for drains and sewers is provided on the BPF Pipes Group website:

[BPF Pipes Group members](#)

