

**SELECTION AND
INSTALLATION OF
PLASTIC INSPECTION
CHAMBERS FOR
UNDERGROUND
DRAIN AND SEWER
SYSTEMS**



PLASTIC INSPECTION CHAMBERS FOR DRAINS AND SEWERS

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 (Water UK, 2021).

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 v3 November 2020)

	Drain	Public Sewer
England	Building Regulations: Part H. Approved Document H	Design and Construction Guidance v2.1
Northern Ireland	Building Regulations: Part N	Sewers for Adoption – Northern Ireland (1st edition), referred to as SFA-NI.
Scotland	Building Standards: Part M. Technical Handbook – Domestic: Environment Technical Handbook - Non-Domestic: Environment	Sewers for Scotland (4th edition), referred to as SfS4.
Wales	Building Regulations: Part H. Approved Document H	Sewers for Adoption (7th Edition), referred to as SFA7

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

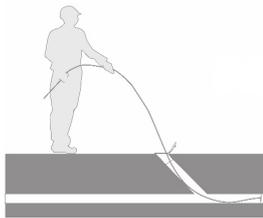
What is an access point?

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.



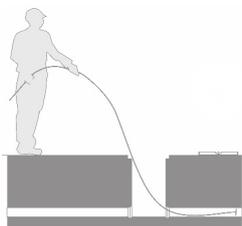
Manholes

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 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 12 m of the connection to a sewer unless access is provided at the connection.	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 v2.1	Sewers for Scotland (4th edition)	Sewers for Adoption – Northern Ireland (1st edition)	
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 12 m of the connection to a sewer unless access is provided at the connection.	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 1 m 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 ^a

(a) This may be increased to 200 m 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

BS EN 13598 Parts 1 and 2 have recently been revised. 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 is now specific to chambers on private drains in well-defined locations and only to chambers located above the ground water table.

BS EN 13598-2: 2020 covers chambers for all other 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 application.”

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: guidance notes.*”

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

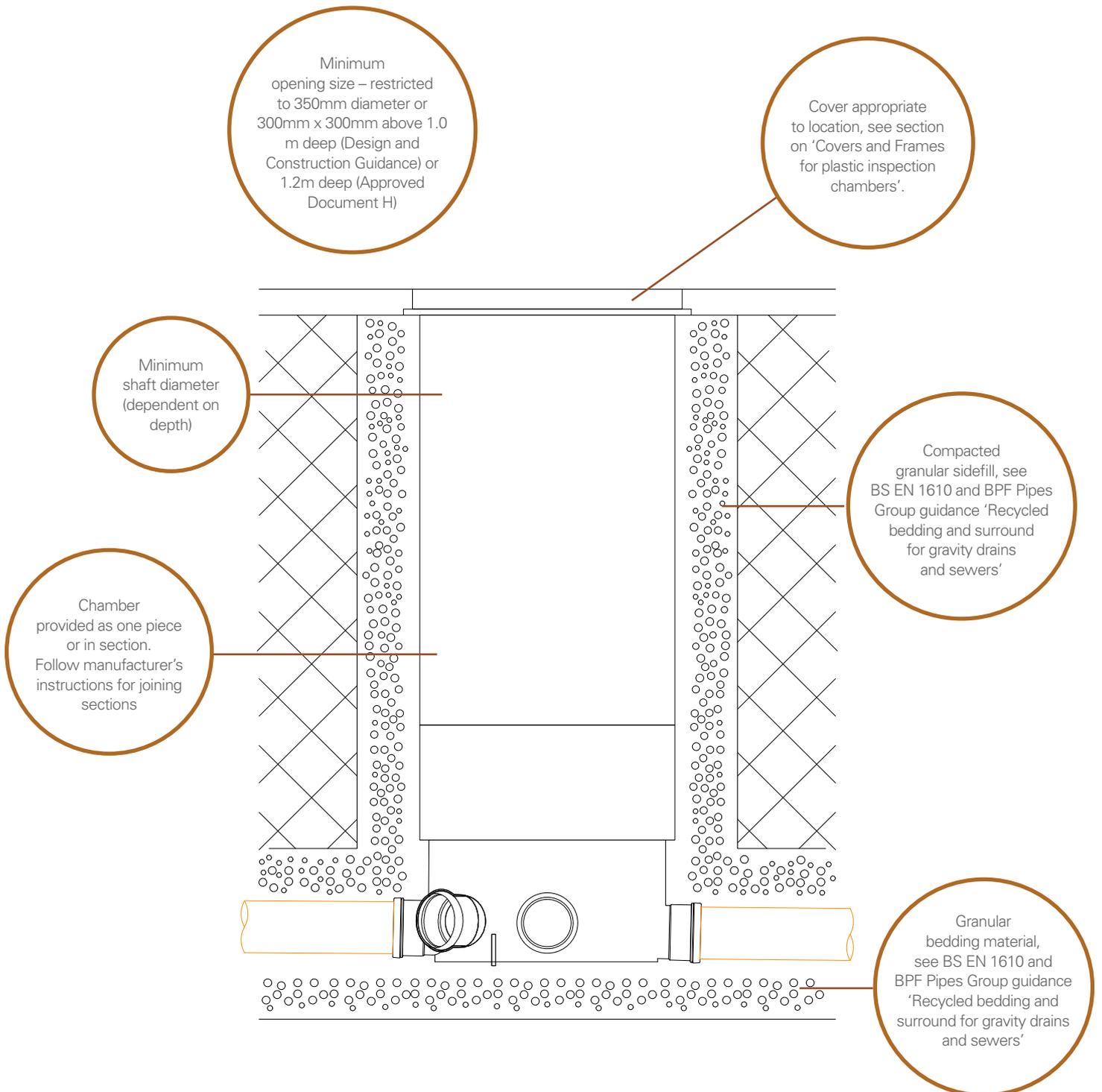
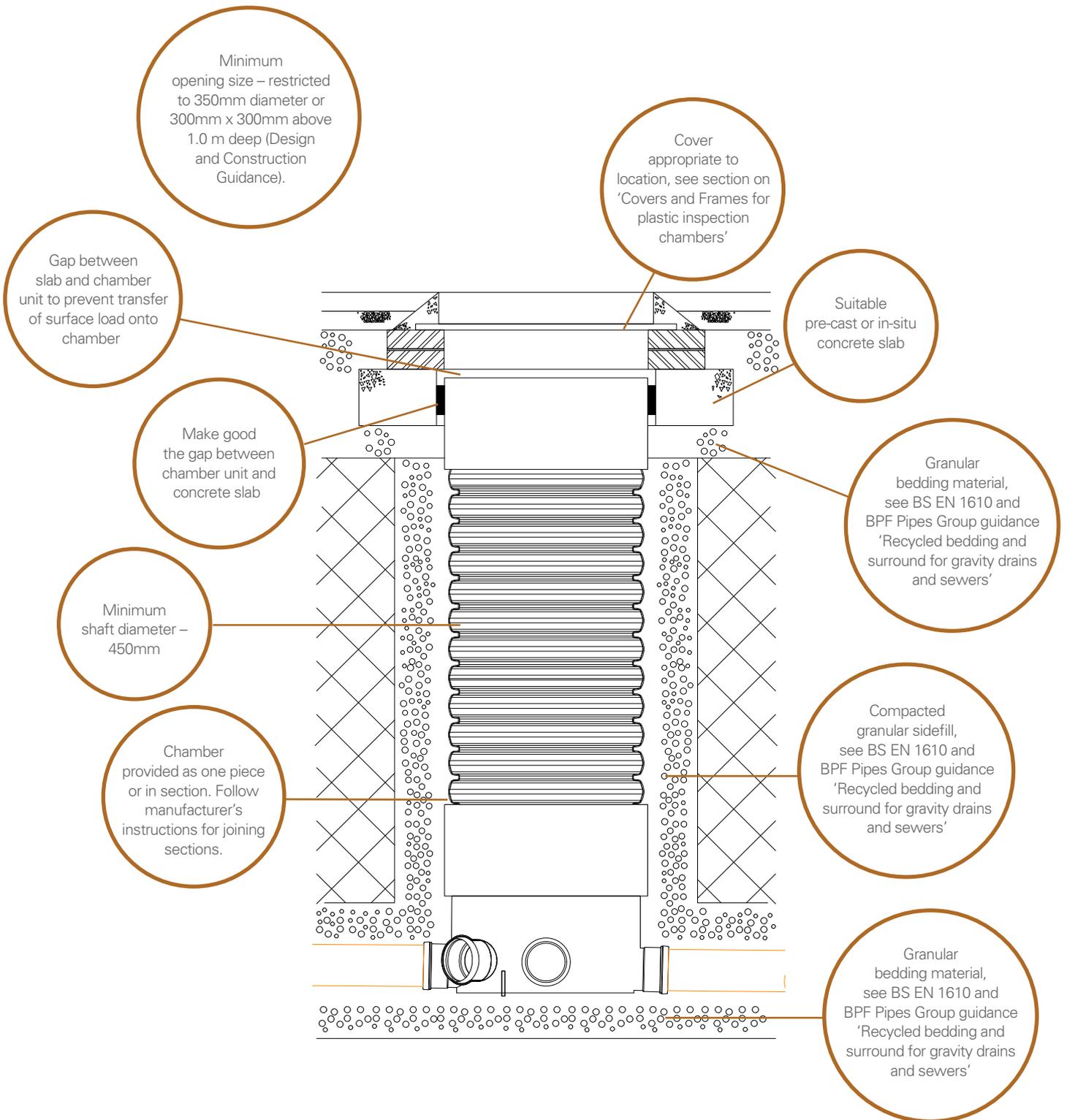


Figure 2 Plastic inspection chamber designed for used in public sewers



Internal Layout

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

- The main channel extends along the whole diameter of the chamber.
- The main channel is 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

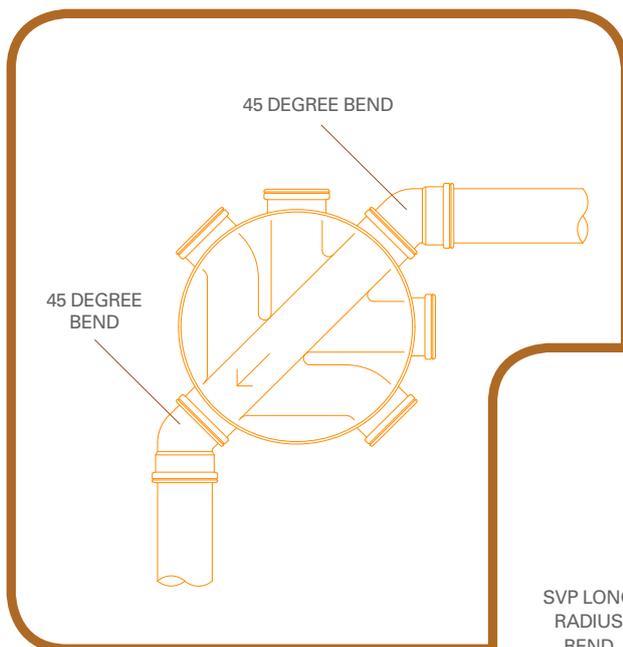
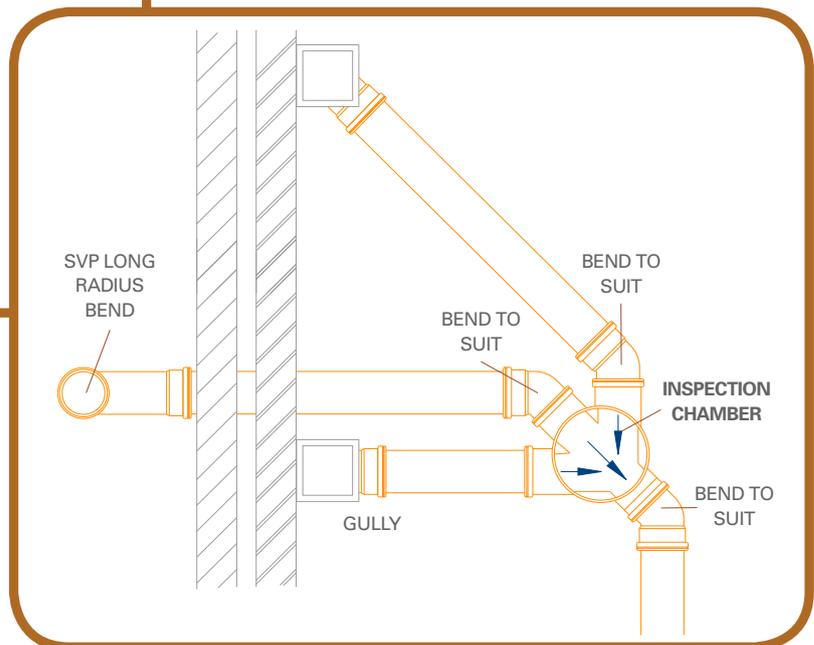


Figure 4



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.
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Covers and Frames for Plastic Inspection Chambers

Selection

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.*”)

For use in applications which are not in the highway, covers for plastic chambers should be selected in accordance with the chamber manufacturer’s recommendations (NHBC Standards). In general, BPF Pipes Group members recommend:

- **For areas where there are no motor vehicles** e.g. for gardens and areas used by pedestrians and pedal cyclists, a load rating of at least 15kN (Class A15 BS ISO 15398 and BS EN 124-1, Group 1 NHBC Standards);
- **For a driveway serving one property** e.g. a short drive leading up to a single or double garage, a load rating of at least 35kN (Class A35 BS ISO 15398);
- **For a driveway serving more than one property or parking area, as well as footways, car parks, and car parking decks** a load rating of at least 125kN (Class B 125 BS ISO 15398 and BS EN 124-1, Group 2 NHBC Standards)
- **For areas with greater traffic loading** a load rating of at least 400kN (Class D400 BS ISO 15398 and BS EN 124-1)

Installation

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. Traffic load 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 vehicular loading to the soil.
 - 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.
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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 2021.

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

<https://www.bpfpipesgroup.com/members/member-listings/>