7.00 MANHOLES AND INSPECTION CHAMBERS

Hunter Underground Systems

7.00 MANHOLES AND INSPECTION CHAMBERS

7.01 ACCESS TO DRAINS

Access may be provided by (non-man-entry) inspection chambers or (man-entry) manholes depending on the depth at which the drain is laid The guiding principle in the location of manholes or inspection chambers is that they should be so situated as to allow every length of drain to be accessible for maintenance inspection and removal of debris The layout should, in general, be designed to satisfy the above principle but in the interests of economy the number of access points should be kept to a minimum. The distance between access is listed in the Table in section 1.6 “Access to drains”.

In general, manholes or inspection chambers should be provided in the following situations:

1. At all changes of direction on drains (except for drains where the change in direction is not too great for cleaning).
2. At all changes of gradient on drains (except for drains where the change in gradient is not too great for cleaning).
3. At all drain junctions where cleaning is not otherwise possible.
4. On a drain within 12m from a junction between that drain and another drain. unless there is an inspection chamber situated at that junction.
5. At the head of each length of drain.
6. At all changes in pipe diameter.

7.02 PREFORMED PLASTIC INSPECTION CHAMBERS

Inspection Chambers are not large enough for man-entry but allow the drain to be reached from ground level. Amendments to Part H of the Building Regulations that came into force April 2002 brought it in line with Table NB.2 of the British Standard for Drains and Sewers Systems Outside Buildings BS EN 752-3: 1997.
Part M of the Scottish Building Regulations was also amended. The table N.B.2 recommends that pre-formed 450mm diameter chamber with 450mm diameter covers are acceptable up to 1.200m in depth and are known as shallow inspection chambers. This allows Hunter Plastics Ltd’s chamber DS50 to be used with five risers or with a cut sixth riser, depth are as shown in the chart below.

ASSEMBLY HEIGHT

	DS50	DS66
Base only	280mm	360mm
Base with 1 riser	444mm	524mm
Base with 2 riser	608mm	688mm
Base with 3 riser	772mm	852mm
Base with 4 riser	936mm	1016mm
Base with 5 riser	1100mm	1180mm

Hunter’s preformed chambers are for use with PVCu pipe or with clay drainage by using the correct adaptor. The chamber is capped with a cover and frame (DS62) for pedestrian driveways and pedestrian areas or a Grade B lid for car parking areas.

DEEP INSPECTION CHAMBERS The amendments allow Building Control officers to accept deeper non-man entry inspection chambers, to be used on drain and sewers. The deeper pre-formed plastic inspection chambers will be 450mm diameter but the opening must be restricted to a maximum of 350mm diameter to prevent people falling down them. This allows them to be used at depths up to three metres for foul or surface water drainage.

DEEP INSPECTION CHAMBERS CONT-

Plastic chambers offer considerable time and financial savings in installation as well as significant health and safety advantages over so-called 'traditional' manholes. If the depth allows it both the shallow and deep inspection chambers are suitable for adoptable or non-adoptable sewers as well as ordinary drainage applications. All polypropylene inspection chambers are much lighter than the alternative engineering brick, concrete, vitrified clay or cast iron, making them quicker, easier and, most importantly, much safer to install. No additional excavation is required and the need for wet trades is eliminated. These chambers can also be installed by hand, without the use of lifting gear or other machinery and cut to the shaft length required. Once in-situ, these plastic units will allow for effective rodding, cleaning and CCTV inspection, without compromising operator safety. Extremely durable and resistant to attack by sulphates in the soil, plastic inspection chambers will give many years of trouble and maintenance-free service.

7.03 Manholes

The dimensions of manholes given in Table NB3 of BS EN752-3 make allowances for man-entry and are large enough to allow for rodding and clearance while standing on the benching, and for the operative to carry breathing apparatus if necessary.

Manholes are normally constructed of brickwork or sectional concrete rings.

BSEN752 should be referred to for other details of construction, step irons and ladders and also access shafts for deeper manholes.

7.04 450mm DIAMETER INSPECTION CHAMBERS
EQUAL 110mm INSPECTION CHAMBER SYSTEM

The Hunter 450mm diameter chamberbase system consists of an injection moulded chamberbase unit complete with integral snap caps and seals, lubricated blanking plugs and support feet. On the 110mm (DS50) separate dry, jointed polypropylene raising pieces are used in conjunction with a frame and cover (DS62).

The 160mm chamberbase (DS66) requires the inclusion of a ring seal (DS67) between the base and 1st riser only, subseqauent risers are dry joint assembly.

The base units are 450mm in diameter and have an effective height of 278mm(110mm) and 360mm (160mm). They conform fully with all current building regulations and BSEN 752 (Table NB2).

Base units are supplied with lubricated blanking plugs. These may be pushed out on site when required and used to secure unused inlets

When making joints, the pipe spigot must be well chamfered, de-burred, cleaned and lubricated using Hunter lubricant.

The pipe is then pushed into the socket allowing a clearing for subsequent expansion ie., pipes should be pushed home fully and then withdrawn by 10mm.

The top riser may be cut using the strengthening ribs for guidance to the required level.

7.05 General installation for all Inspection Chambers

All inspection chambers must be installed in accordance with the following instructions.

Bedding Procedure
Where a Grade A cover is to be used, the chamber base should be bedded with the invert to line and level, on a 100mm depth of 10mm nominal, single-sized aggregate having no sharp edges. Alternatively, granular material in accordance with the recommendations of Appendix A, may be used, but having a particle size not exceeding that specified in Table 1 for a 110mm diameter PVCu pipe. If a Grade B cover is used, the chamber should be surrounded in concrete (see Figure 2 below).

The 450mm inspection chambers may be used in conjunction with a Grade A or Grade B cover depending on the application.
Note1: Inspection chamber covers Class A15 should be used in areas which can only be accessed by pedestrians and pedal cyclists. Class B125 covers are for footways, pedestrian areas and comparable areas, car parks or car parking decks.

Where the Hunter cover (DS62) is used, the cover and frame is to be supported on a concrete base while the chamber is surrounded by granular backfill as recommended by Appendix A. (See section 5.09 Bedding and Backfilling). When a Grade B cover is to be used, the chamber should be fully supported in a concrete surround.

Figure 1

Polypropylene lockable cover & frame 3.5 tonnes wheel load suits pedestrian areas/domestic driveways. Complies with Building Regs Part H.

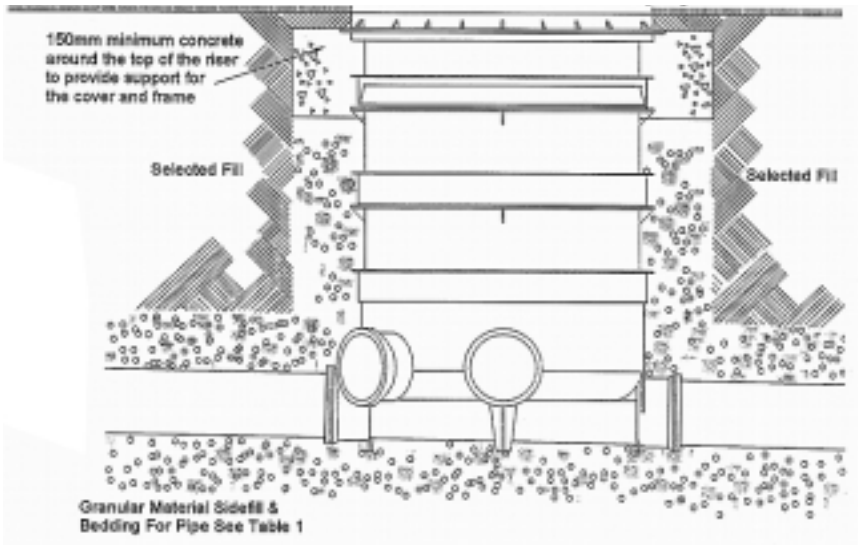
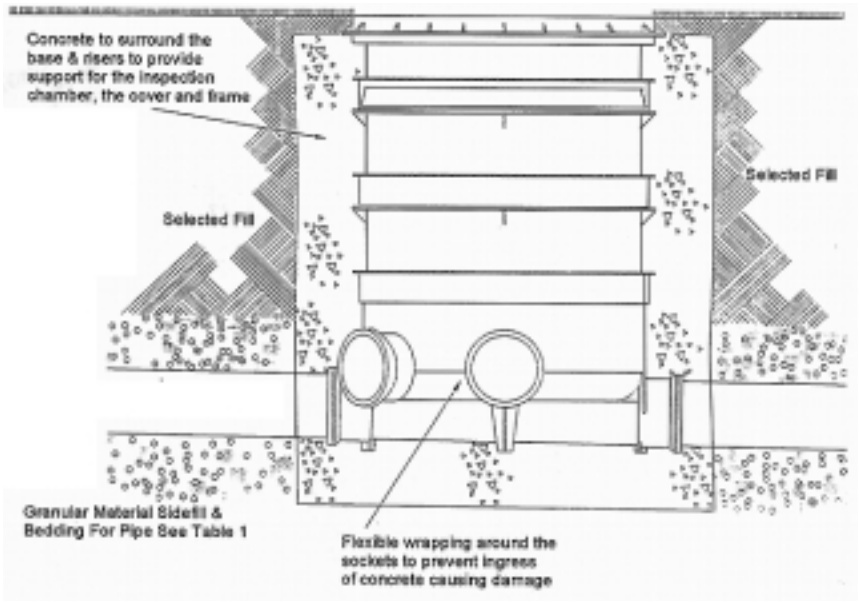


Figure 2

EN124 CLASS B125 cover (supplied by others)



7.06 250mm INSPECTION CHAMBERS

The injection moulded 250mm diameter inspection chambers allow access to drains within close proximity to any building. They can accept up to three connections and be used at depths of up to 600mm.

The base comes complete with two lubricated blanking plugs {DS56) to secure unused inlets which can be pushed out as required on site, eliminating the need for fabrication or use of adhesive.

Two 45° swept inlets allow for efficient flow into the 110mm main channel.

The base unit is 250mm in diameter, has an effective height of 189mm and fully conforms with all current building regulations and BSEN 752.

CONFIGURATION	INVERT HEIGHT (mm) *
Base only	189
Base with one riser	394
Base with two risers	600

* Complete with PVCu sealed frame and cover (DS69)

The top riser may be cut using the strengthening ribs for guidance to the required level.

The 250mm units may be used with a circular aluminium (DS39) or PVCu (DS69) cover and frame or square top frame and cover (DS68).

The (DS69) PVCu cover and frame incorporates a sealing ring and screwdown cover to achieve an airtight fit. This is a requirement in the building regulations for inspection chambers situated within buildings. However the robust black PVCu frame and cover is also ideally suited for external use.

A sealing ring (DS40) may be purchased separately and used in conjunction with DS39 to form an airtight cover.

7.07 INSTALLATION OF 250mm INSPECTION CHAMBERS

General

The chambers must be installed in accordance with Hunters instructions.

Procedure

1. Where a Grade A cover is used, the chambers should be bedded with the invert to line and level, on a 50mm layer of 10mm nominal, single-sized aggregate having no sharp edges. Alternatively, 100mm depth of granular material in accordance with the recommendations of Appendix A may be used, but having a particle size not exceeding that specified in Table 1 for a 110mm diameter PVCu pipe. If a Grade B cover is use the chamber should be surrounded in concrete.

2. When making the joints the pipe spigot must be well chamfered, de-burred, cleaned and lubricated using the recommended lubricant. The pipe is then pushed into the socket seal allowing a clearance for subsequent expansion, ie the pipes should be pushed home fully and then withdrawn by 10mm.

3. Where a Grade A cover is used, backfilling is carried out using suitable granular material as described in (Appendix A* or Table 1) up to a level of 100mm above the crown of the inlet and outlet pipes, and is continued in well compacted layers not more than 300m deep. Care must be taken to avoid excessive deformation of the chamber wall.

4. During backfilling, the chambers should be covered to prevent ingress of foreign matter into the drain.

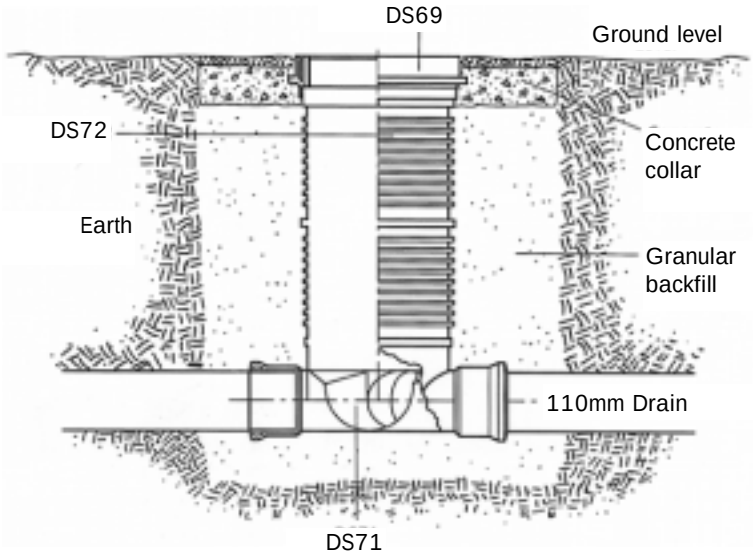
5 It is important that when a Grade B cover is used the chambers must be protected from heavy loads by an adequate concrete bedding and surround. The correct methods for bedding a Grade B is shown in the bedding procedure for 450mm chambers.

6. If the chamber is to be installed in ground where the water table may rise e above the invert level of the chamber the chamber must be bedded on and surrounded by concrete in a similar manner to installation where Grade B cover is used.

7. Precautions must be taken to protect the chamber from damage by construction site traffic.

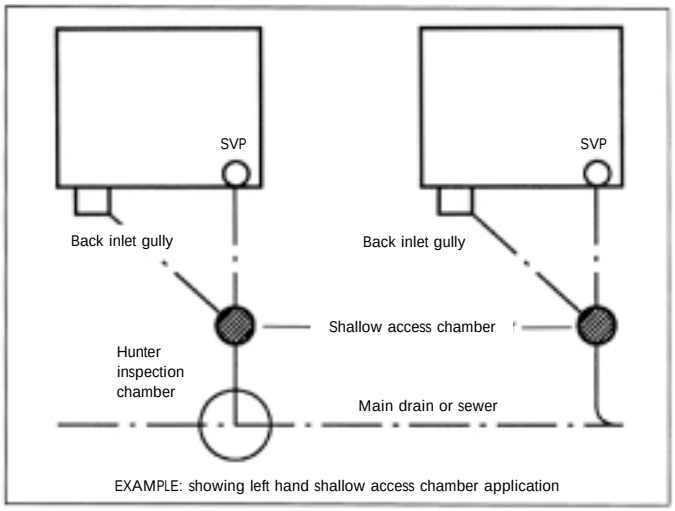
8. During backfilling, the cover and frame should be placed in position to prevent ingress of foreign matter into the drain and excessive deflection of the chamber walls.

9. A concrete collar is placed to secure the frame (See diagram below).

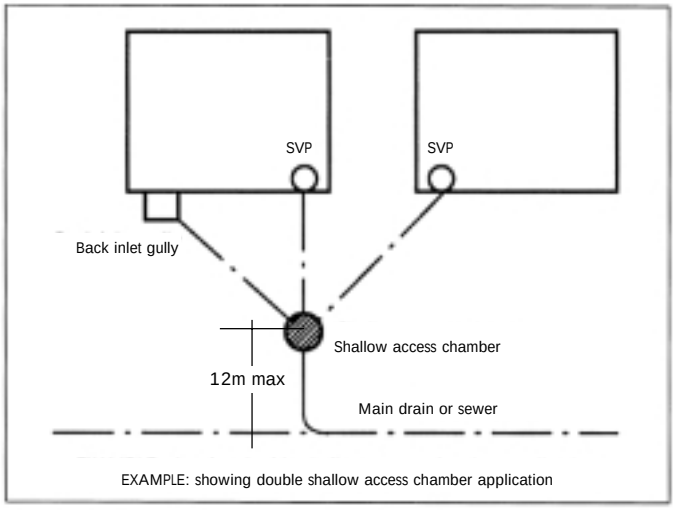


7.08 SHALLOW ACCESS CHAMBERS

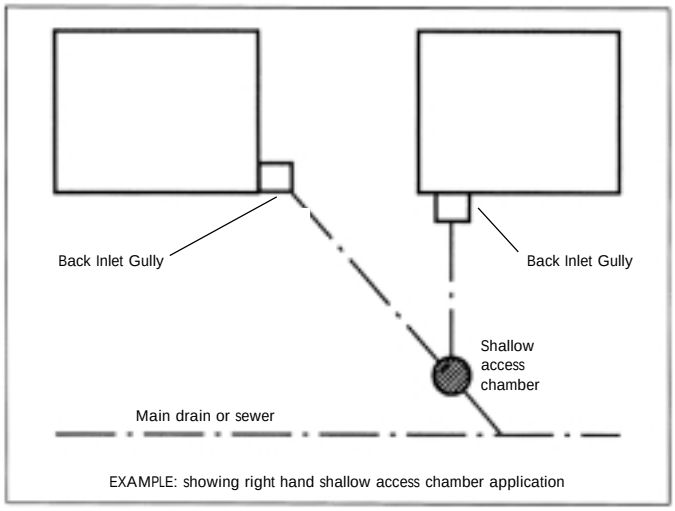
BSEN752 states that “where a branch drain joins a main pipe without an inspection chamber or manhole at the junction, access should be provided on the branch within 12 metres of the junction”. Therefore, by using the Hunter Shallow Access Chamber, the need for inspection chambers at the junction of the main sewer is minimised. All standard rodding equipment may be used with the Hunter Shallow Access Chamber.



EXAMPLE: showing left hand shallow access chamber application



EXAMPLE: showing double shallow access chamber application

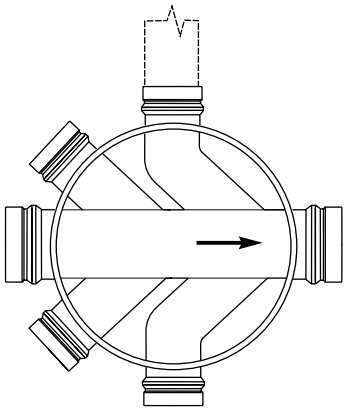


EXAMPLE: showing right hand shallow access chamber application

7.09 HUNTER CHAMBER BASES, USING SIDE INLETS

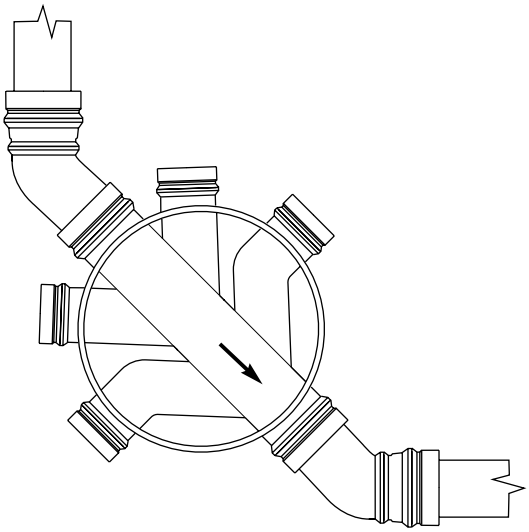
It has been found that inappropriate use of the side connections on the inspection chamber base has led to blockages occurring. Notably this occurs when only one side inlet is used at the head of the drain and/or the gradient of the pipe into the chamber is excessive. Without any other flow through the chamber the solids are deposited on the opposite side of the channel and cannot be washed away. See Figure 1.

Figure 1



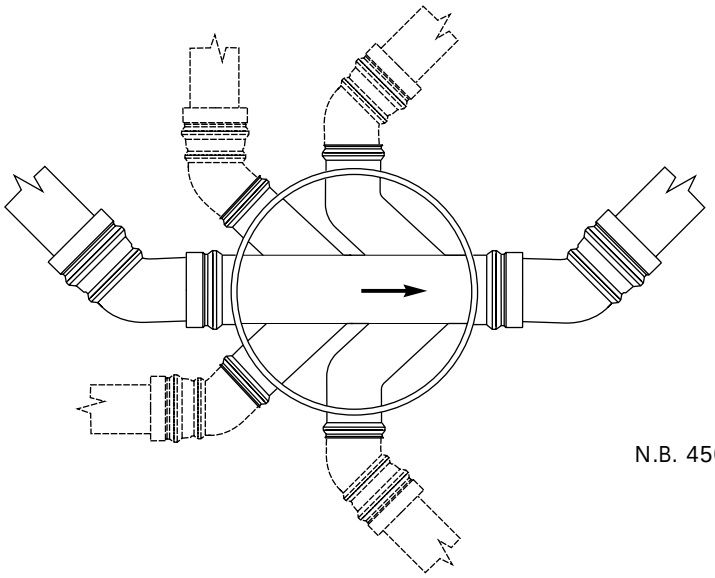
This problem will not occur if the flow is guided through the main channel by using 45˚ spigot tail bends on the inlet and outlet. See figure 2.

Figure 2



Changes of direction should be accessible in case a blockage occurs, therefore bends should be sited immediately on the inlet or outlet or a manhole or an inspection chamber. However an angle of not more than 45˚ should be used so that the flow is not impeded or access for CCTV is restricted. See the example in figure 3.

Figure 3



N.B. 450 x 110mm system depicted

7.10 INSTALLATION OF SEALED ACCESS FITTINGS

Manholes with Sealed Access Fittings are generally constructed in the same way as traditional manholes but as watertightness is not critical, unlined brick or concrete manholes may be permitted. Benching of the pipework is essential.

1. Bed all Sealed Access Fittings in cement mortar on a suitable concrete base.

2. Make pipe connections in the same way as the standard Push-fit jointing of fittings.

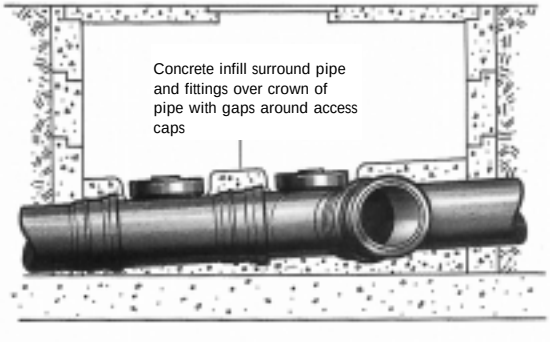
3. Allow pipe ends to protrude beyond the edge of the manhole base so that connections can be made after the manhole walls have been built.

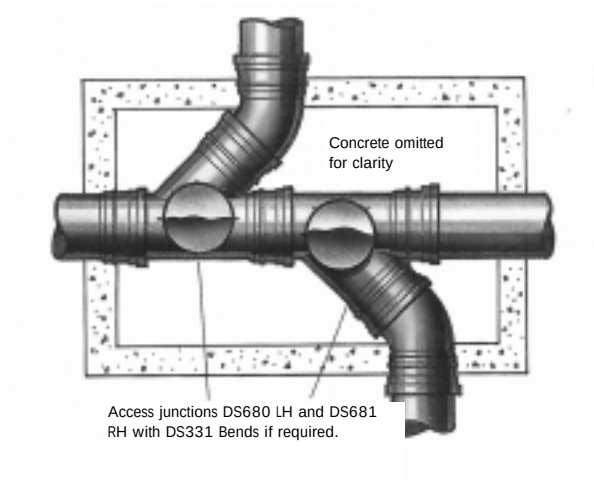
4. Slope benching of the pipework so that standing water will drain into the Access Fitting when the cover is unscrewed. The benching must provide adequate clearance for the access cover to be removed, for routine servicing. Undue force should not be used during the tightening process.

5. Where standpipes are specified, fit these to the boss socket on the side of an Access Pipe DS309 or DS472.

6. Use Sealed Access Fittings inside buildings in manholes with single seal manhole covers and for installations of suspended basement drainage.

The details below shows the construction of a manhole at the junction of two branch drains into one, using access junctions. In this detail the manhole is shown constructed from concrete sections, as it is not necessary to construct watertight manholes owing to the use of Hunter sealed access fittings.





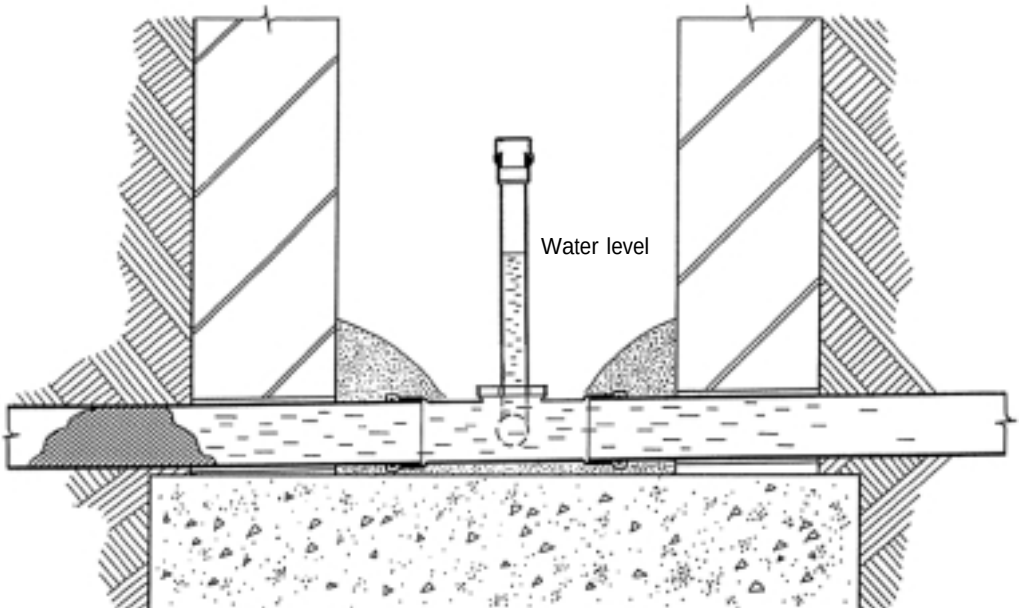
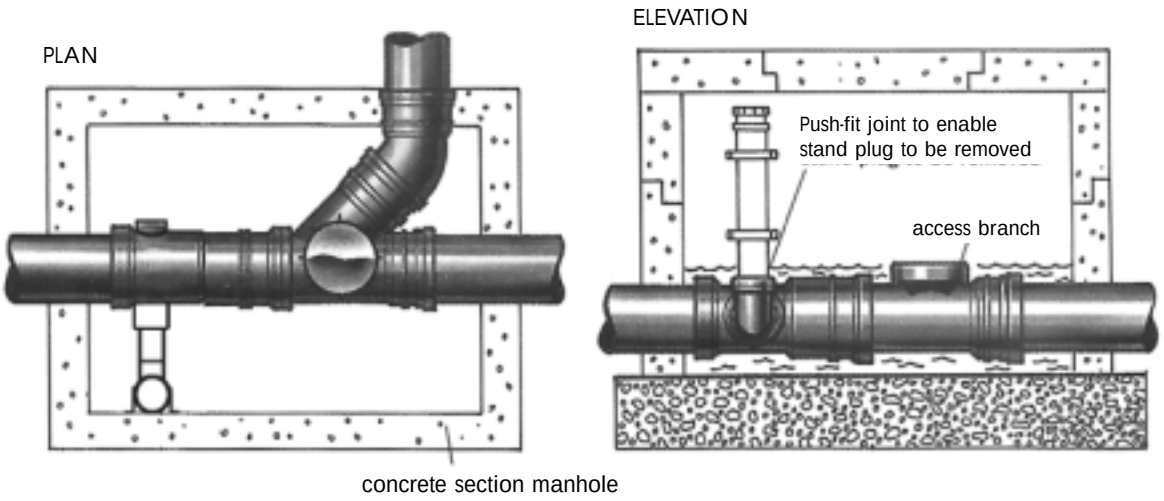


Diagram showing standpipe in a manhole for detecting within the system

7.10 INSTALLATION OF SEALED ACCESS FITTINGS CONT-

The necessity for waterproof manholes is obviated when using Hunter sealed drainage systems. The detail below shows the recommended methods for dealing with ingress of water in the base of manhole chambers. It should be noted that this arrangement will only be necessary for use on very damp soil or any situation incurring a high water table or where the manhole is likely to act as a catch-pit for surface water.



7.11 RODENT CONTROL

Along with Non-Return Valves (See section 8.14) sealed drainage systems can be used where special measures are required to control rodents. However, they should only be used in shallow inspection chambers where maintenance can be carried out from the ground level.

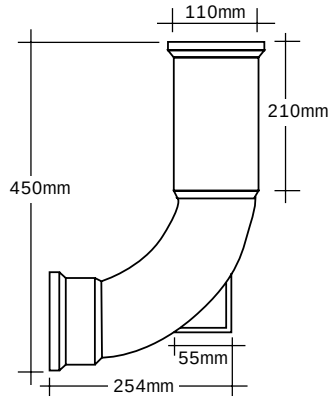
7.12 DRAINS WITHIN BUILDINGS

Drains should be laid external to the building wherever possible, however, branch drains from internal appliances and soil stacks make some drain pipe under building inevitable. For larger buildings the options to consider are drainage suspended at high level or in an underfloor duct , or drains lain in the ground under the lowest floor. When a drain route passes through or under a building structure, it is imperative to consider the effects of differential settlement between the structure and the drain. Consequently Hunter Plastics Limited had manufactured a long radius rest bend with a triple expansion socket to cope with this problem (DS664). See the diagrams below.
It might be difficult to provide external overflow point, such as open gullies to warn of a blockage with the internal drainage system. Therefore, to prevent surcharging causing flooding of the building the designer may with to consider the use of Hunter's Non-Return Valves in 110mm (DS342) or 160mm diameter (DS442). See the diagram in section 8.14.

Where it is not possible, to contain any surcharging of the drainage Hunter Plastics Limited manufacture a range of screw cap type access fittings that can be incorporated into the pipe system. The range of products for suspended pipes will be found in our above ground soil pipe system. Access fittings used within the underground drainage are fitted into a manhole. See the diagrams and text below. To tell how far within the building the drainage is blocked, standpipes with an access cap can be fitted at each manhole. See section 8.11. Effluent in the standpipe warns of a blockage, therefore the manholes down the line have to be inspected to find a clear manhole from which to rod the system and remove the debris. See the diagram below in section 8.11.

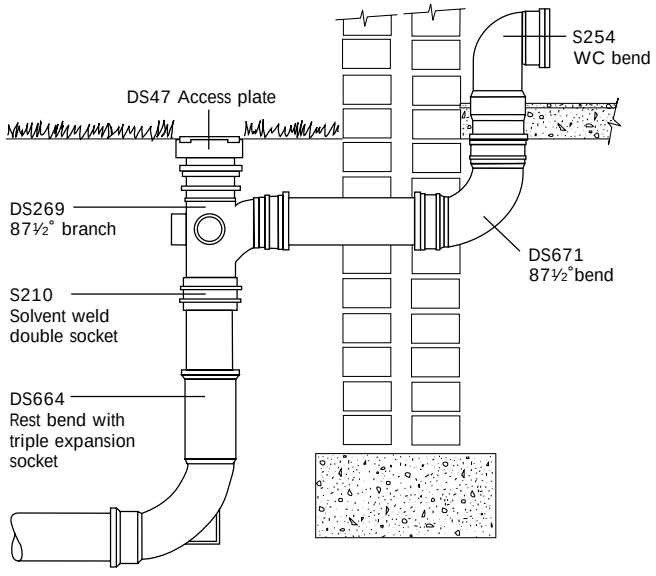
For domestic properties Hunter's shallow inspection chambers with a sealed cover, such as the DS69 or DS39 with sealing ring DS40, can be used instead, but the depth from cover to invert must not exceed 600 millimetres. See details in section 8.08 250mm Inspection Chamber.

Dimensions

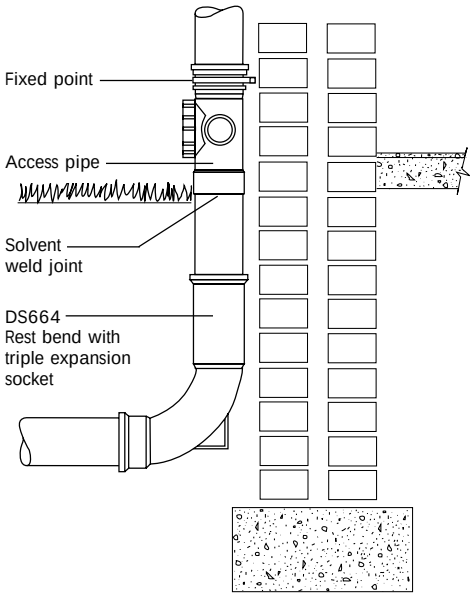


Long Radius Bend - Code No. DS664 (110mm ∅)

- The long radius bend is manufactured in PVCu and complies with requirements as laid down in BS EN 1401
- The radius of the bend meets with the recommendation as specified in BS EN12056 200mm minimum at the base of soil stack.
- Incorporates a support leg at base of bend for ease of installation.
- Where ground conditions are such that settlement could occur, then the specially designed triple expansion socket can accommodate up to 150mm movement.



GROUND FLOOR CONNECTION TO WC



EXTERNAL SOIL STACK

7.13 NON-RETURN VALVE DS342/DS442

In accordance with Approved Document H1 of the Building Regulations and British Standards 8301: 1985, where a drain is liable to surcharge, measures should be taken to protect any building and ancillary area likely to be adversely affected. The measures necessary to protect a drainage system or building from surcharge should be as simple a possible and be so arranged as to have minimal effect on the drainage system.

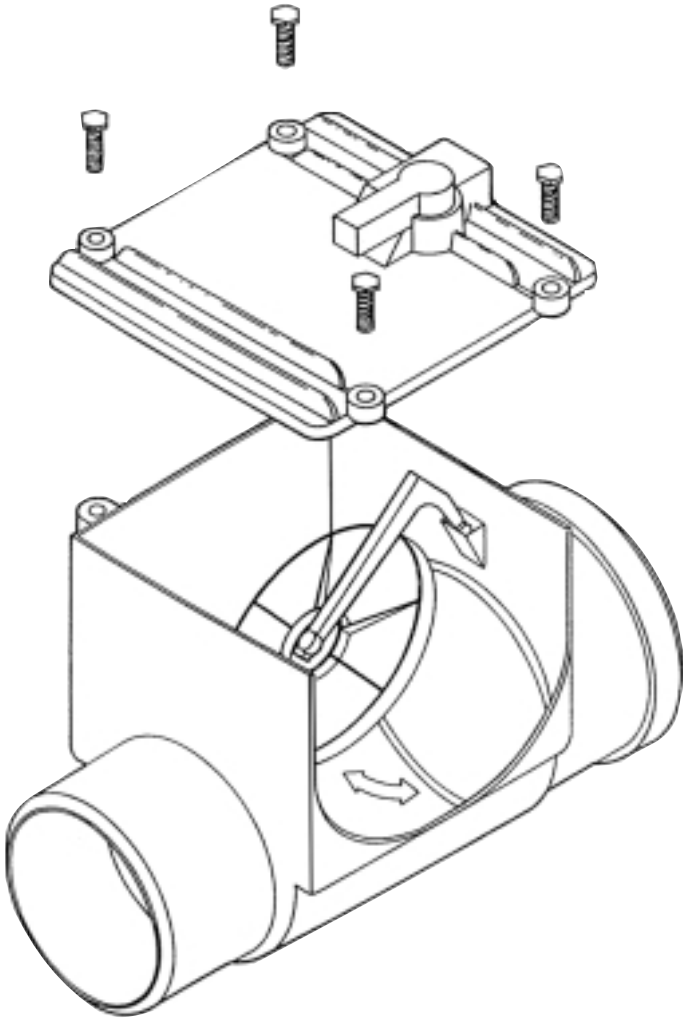
Hunter's Non-return valve is a simple, effective way to eliminate flood risk caused by back-flow through drainage channels.

The integral flap valve is the simplest design and when installed within the drain run the valve offers the most effective means of preventing flood damage.

Made from tough, anti-corrosion PVCu in 110mm and 160mm sizes.

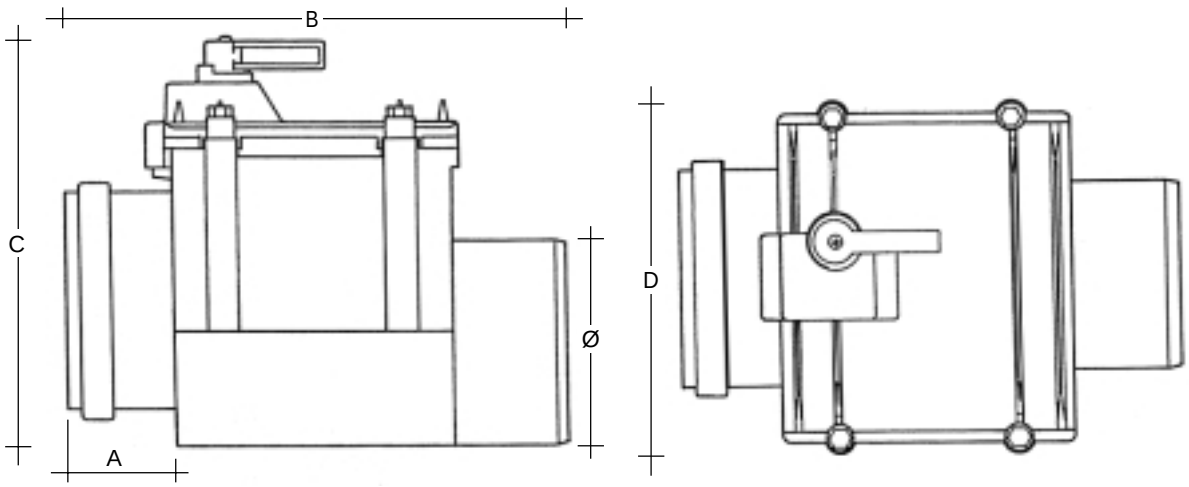
SUITABLE FOR:

- Low lying coastal, lake or valley areas where a drainage system is laid to shallow depths or with flat gradients
- Where the building level is below the upper level of the main sewer
- Low lying coastal, lake or valley areas where a drainage system is laid to shallow depths or with flat gradients
- Where rainwater is channelled into the main sewer, making it liable to flooding during heavy rainfall
- Commercial and industrial applications where non-pressure flow control is required, for example, fish farming
- To reduce rodent ingress



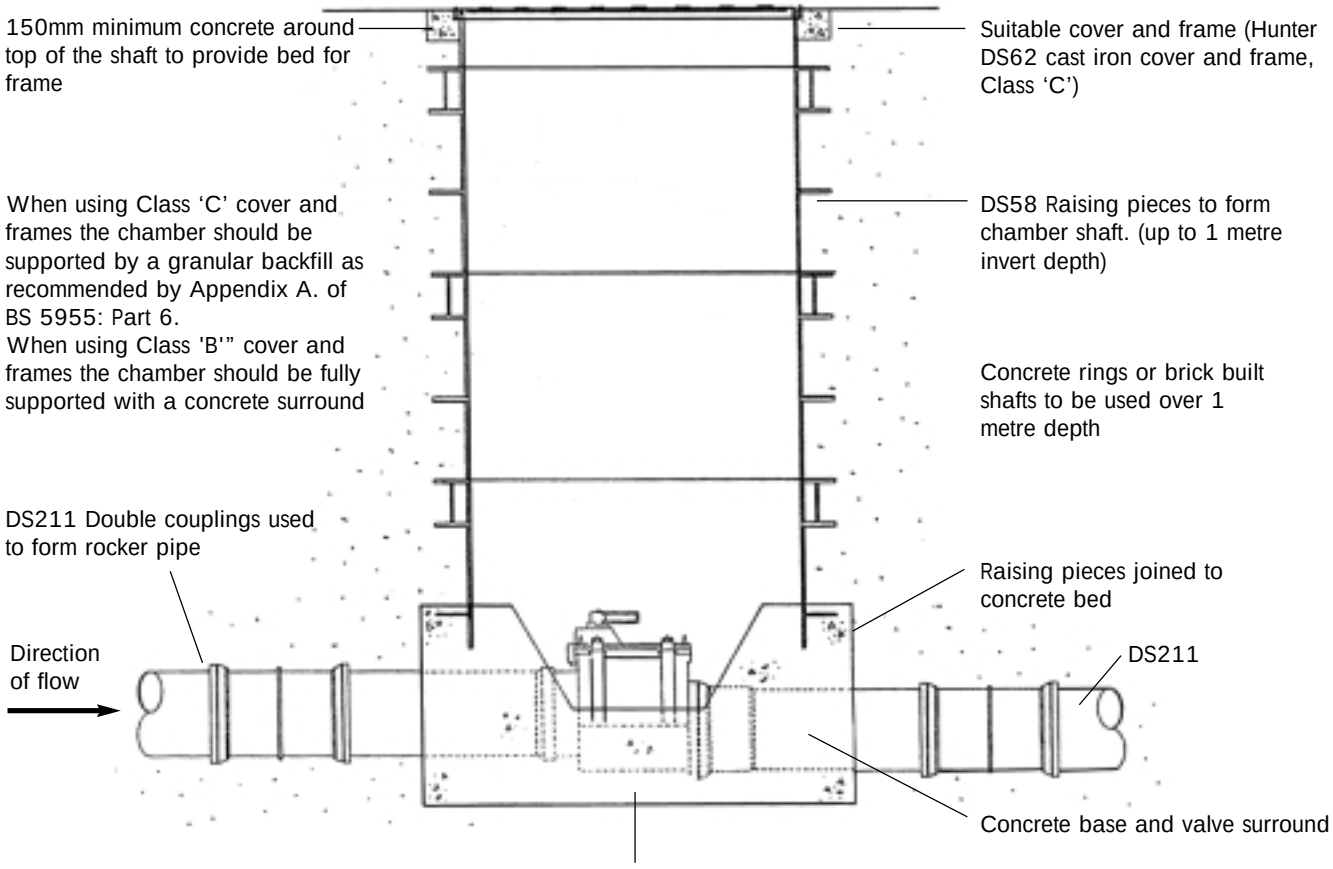
Note: recommended for installation within an access point for regular inspection maintenance and cleaning (See installation notes on next page).
Applications confined to surface and clean water systems only.

7.13 NON-RETURN VALVE DS342/DS442 CONT-



Dimensions (mm)	Ø	A	B	C	D
DS342	110	61	270	215	190
DS442	160	74	334	256	230

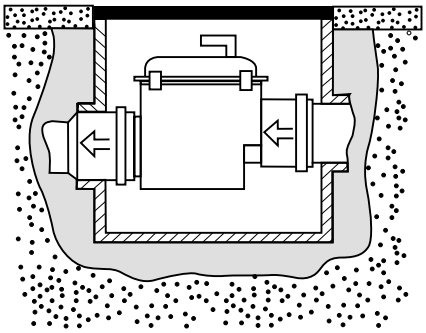
Note: The top of the valve is removable to aid cleaning and maintenance. The bolts use to secure the valve top can be removed using a 13mm socket or open-ended spanner.



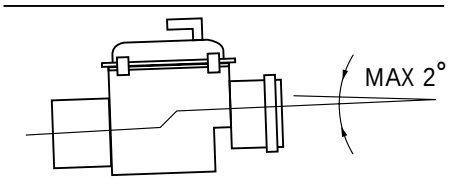
The valve should be installed within the drainage run and must be horizontal. This ensures that the flap opens under normal flow conditions and positively shuts off under surcharging conditions

7.14 NON-RETURN VALVE INSTALLATION NOTES

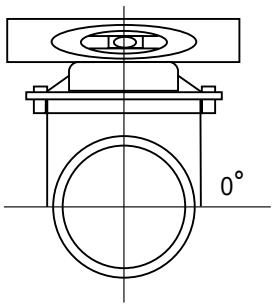
Install the non-return valve into its own chamber to make periodical inspection easier. Ensure that it is installed the right way round (socket upstream)



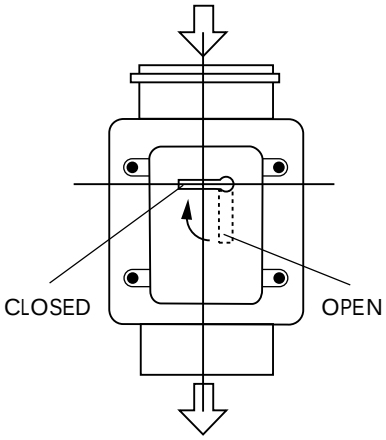
Install the value longitudinally to the pipe, the maximum slope should not be more than two degrees (fall 1:27)



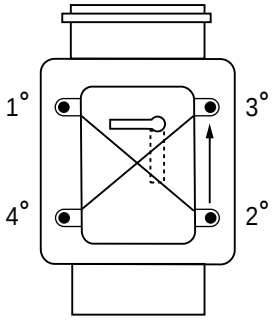
To ensure perfect operation of the valve it must be perpendicular (see drawing).



In order to periodically inspect the valve, rotate the handle toward the position ‘closed’. In case of resistance to the rotation, remove the cover and clean the inside of the valve. Leave the handle in the open position under normal working conditions.



If the valve is positioned downstream of the soil pipe, the valve must be inspected frequently. Gradually tighten the bolts in the order shown 1 - 2 - 3 - 4.

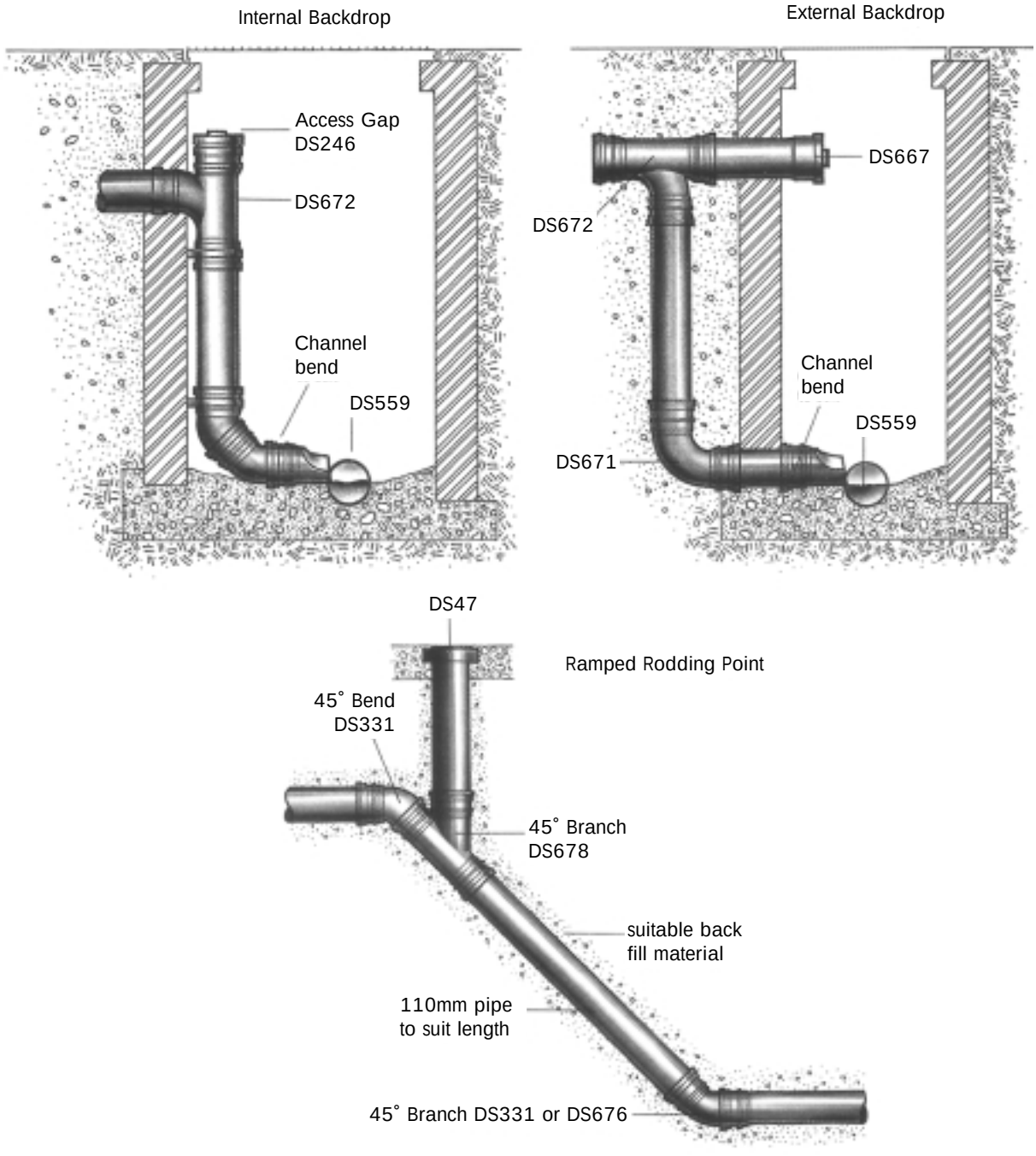


7.15 BACKDROP MANHOLES OR TUMBLING BAYS

These are designed to accommodate significant differences between invert levels by building a manhole on the lower drain and providing a vertical or nearly vertical drop-pipe from the higher drain.

A drop-pipe on a branch drain should terminate at its lower end with a bend turned so as to discharge its flow at 45° or less to the direction of flow in the lower drain.

Where the difference in invert levels is less than 1.8m, a ramp may be formed by increasing the gradient of the last length of the upper drain to about 45°.



7.16 TRADITIONAL MANHOLE SYSTEM

Tables showing the minimum dimensions of manholes are found in The Building Regulations Approved Document H1 and BSEN 752 Part 3. They can be of any depth, consequently their size allows personnel to work within the chamber at drain level. Manholes are constructed from precast concrete risers of engineering bricks supported on a concrete base and enclosed with a frame and cover. BSEN 752-3 states that 'Where practical the channel should be the same material as the drain or sewer', therefore Hunter Plastics has produced a range of 45˚ and 87½˚ channel bends plus a straight through and 87½˚ long radius channel pipe. The 87½˚ channel bends need to be cut on site to suit the angle of entry; therefore, we have produced a product selector guide on the following page. The various angles shown are obtained by cutting with a fine toothed saw through the spigot end of the bend when laid in position on the channel pipe.

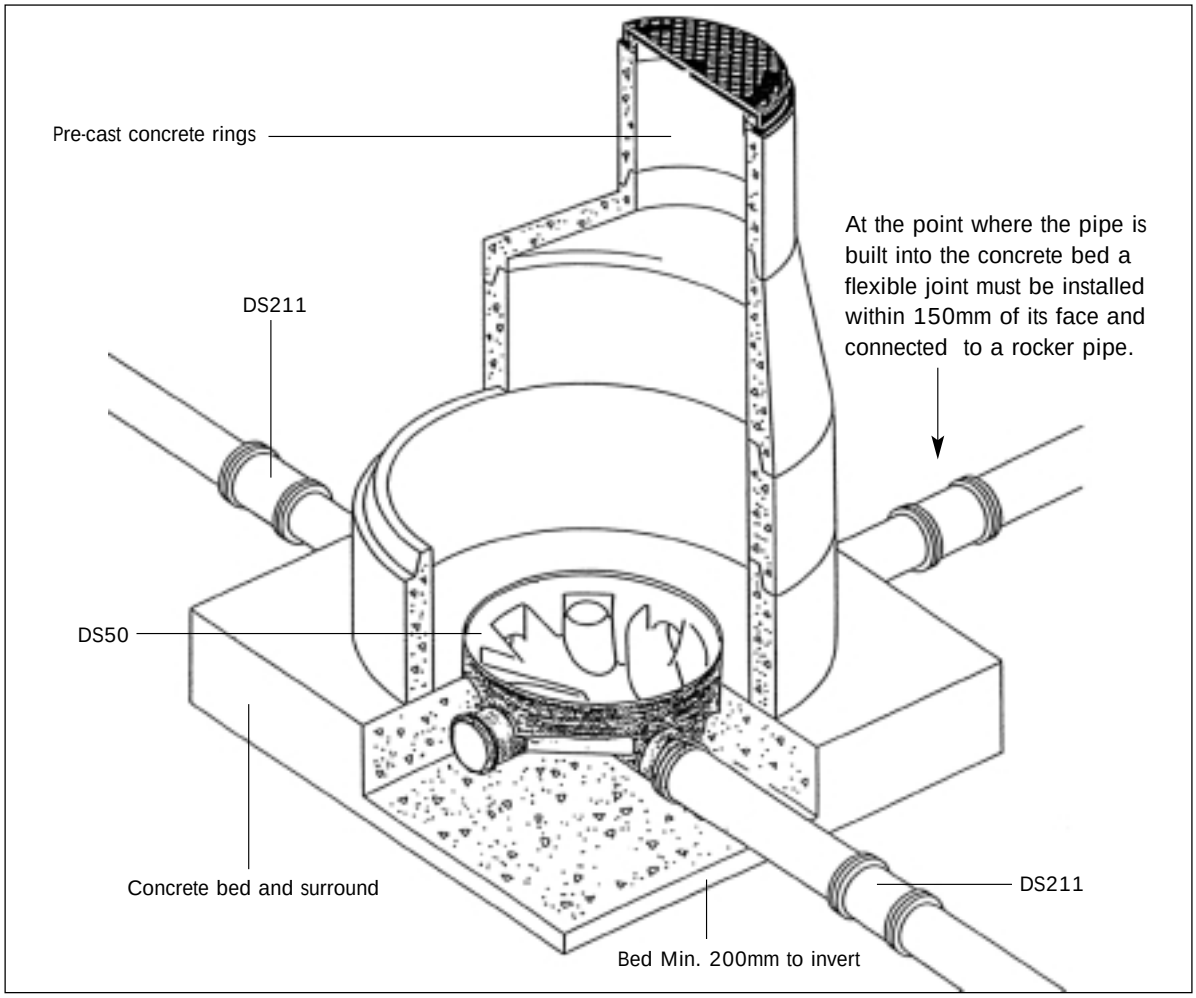
After assembly the whole installation needs to be benched, therefore, the external surfaces of the 45˚ and 87½˚ channel bends are coated with a black graphite paint to give a key for the cement mortar benching. To key the PVCu pipe to accept the benching, roughen it with sandpaper or emery cloth, clean with solvent cleaner and coat it with solvent cement. While still wet it should be sprinkled with clean dry sand and allow to dry.

In case of settlement, rocker pipes should be fitted to pipe outside of the chamber.

For full details of manhole construction reaction NB.4 of BSEN 752-3: 1997.

Using chamber bases with manholes

Hunter chamber bases are designed for use with the preformed raising pieces to form inspection chambers, however they could be used within deeper manholes as long as the chamber width was sufficient to provide a stable footing for workers at the base level. Section NB.4 and table NB2 of BSEN 752-3: 1997 should be referred to for further details. Please find here a diagram showing a possible application of the DS50 chamber bases.



7.17 INSTALLATION OF CHANNEL FITTINGS

1. Bed all round channel pipe and channel fittings in cement mortar on a suitable concrete base.

2. Side entries into the main channel should have an angle of entry not greater than 90˚ at the internal face of the inspection chamber or manhole. For entries greater than 90˚ bend should be placed adjacent to the manhole, which should provide a deviation of not more than 45˚.

   The Hunter range offers a number of 3/4 sectional bends which can be cut on site to suit angles of entry into any inspection chamber or manhole of between 30˚ and 90˚ .

3. Bed the bends in cement mortar and connect them to the main channel so that the discharge from the branch is in the direction of flow of the main channel.

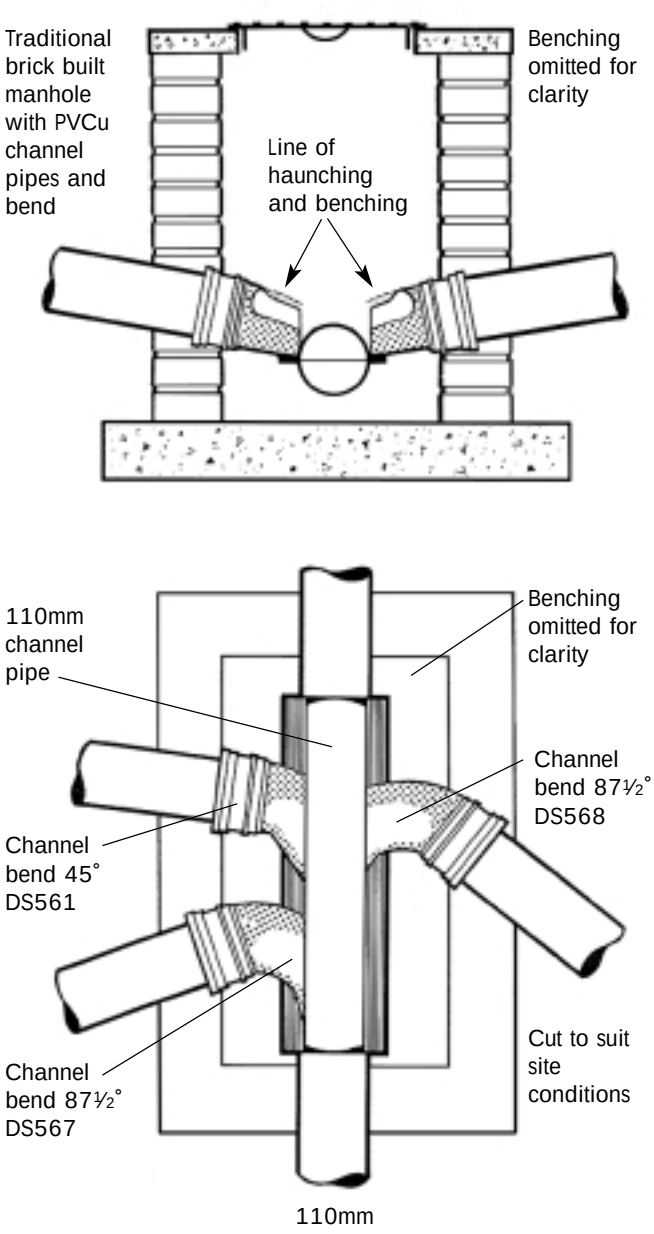
4. Allow pipe or fitting ends to protrude beyond the edge of the manhole base so that connections can be made after the manhole walls have been built.

5. Provide concrete benching to rise vertically from the top edge of the channel pipe to at least the height of the outlet soffit.

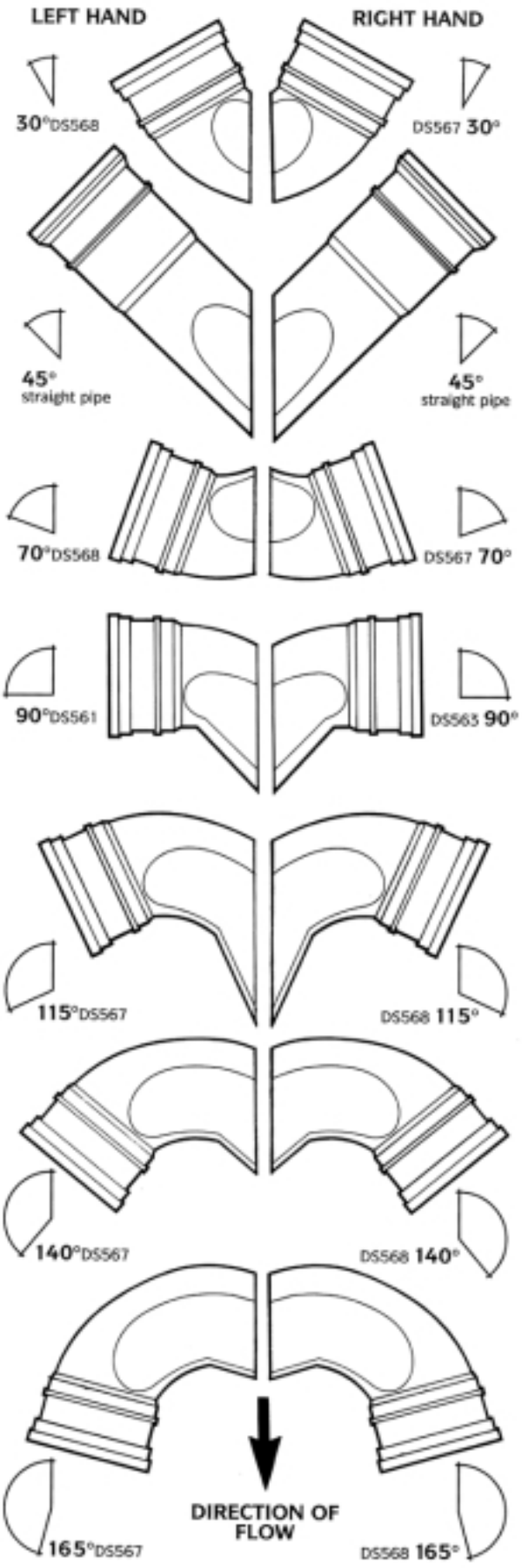
6. Shape the benchings round the channel bends of the branch drains to guide the flow of sewage into the desired direction.

7. Where practicable ensure the soffits of the main pipes entering and leaving a manhole maintains a similar gradient.

Manholes in traditional style, using open channels



This detail shows one alternative for running branch drains into a manhole via a 3/4 section short radius channel bend


LEFT HAND
RIGHT HAND
30° DS568
DS567 30°
45° straight pipe
45° straight pipe
70° DS568
DS567 70°
90° DS561
DS563 90°
115° DS567
DS568 115°
140° DS567
DS568 140°
DIRECTION OF FLOW
165° DS567
DS568 165°