Section 6

Buried drainage – technical

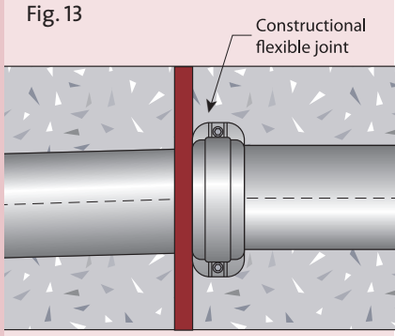
Ensign cast iron drainage 1st choice for shopping centres

Ensign has the strength and versatility vital for large, dynamic commercial developments:

- strong – once installed, Ensign has the strength to withstand the rigours of the construction site
- fit and forget – peace of mind
- versatile – retro-fitting of additions or changes to soil stacks is quick and simple

Design recommendations

Fig. 13



Trench preparation
Ensign may be laid directly into a naturally trimmed trench allowing 50mm clearance at each joint between coupling and trench bottom. The trench bottom should be flat to give continuous support to the pipework.

If the subsoil cannot be accurately trimmed with a spade, the trench should be excavated to a depth of 100mm below the pipe invert and a granular bed laid. This also should allow 50mm clearance at each joint between the coupling and the granular bed. Where Ensign is to be set in concrete, the trench should be prepared as above to allow a minimum of 100mm of concrete under the pipe.

The pipe should be supported on a compressible material (eg. expanded polystyrene), either side of each joint. The concrete should have a suitable flexible joint at intervals not greater than 5 metres in order to reduce the natural rigidity of the concrete. This should be made of a compressible material (eg. expanded polystyrene) which should be placed next to a pipe joint, and conform to the full cross section of the concrete. (See Fig. 13).

Haunching and surround should not be carried out until the pipework has been tested and inspected.

Testing

Water test – Gravity drains should be tested to an internal pressure of 1.5 metre head above the invert of the pipe, at the high end of the drain, but not more than 4 metre head at the lower end. If necessary, pipe lines, may be tested in sections.

Air test – Pipework should withstand a pressure of 100mm water gauge and this should not fall by more than 25mm in a 5 minute period. However where traps or gullies are connected they should withstand a pressure of 50mm water gauge and this should not fall by more than 12mm in a 5 minute period.

It is recommended that pipework installations are tested in sections rather than waiting to complete in one operation.

Differential movement
Ensign couplings allow up to 3° deflection at each joint.

Pipelines leaving buildings, manholes or other structures which are likely to be subject to settlement, should have a minimum of two joints, a maximum of 600mm apart, thereby allowing a short length of pipe to act as a 'rocker pipe'. The joint nearest the structure should be as close to it as possible and, in areas where large settlement is expected, more than one 'rocker pipe' may be required. *(*See Fig. 16, *page 74).*

Minimum depth of pipework
Ensign can be installed under most buildings without further protection. Where Ensign is installed under roads and yards subject to normal usage, it is advisable for additional protection to be considered if the cover is less than 1.2m.

However, in areas that are subject to special loadings or abuse, extra protection should be considered.

Falls
Pipework gradients should be chosen to obtain a self-cleaning action under normal discharge conditions. For flows of less than 1 litre/second. a gradient of 1 in 40 for 100mm pipe and 1 in 60 for 150mm pipe are usually sufficient and for practical purposes, the gradients should not be less than 1 in 80 for 100mm pipe and 1 in 150 for 150mm pipe.

Note: See BS EN 752-1 and relevant building regulations for further information.

Design recommendations

Minium bedding – limits of cover

The choice of bedding and backfilling depends on the depth at which the pipes are to be laid and the size and strength of the pipes. Rigid pipes like cast iron are more robust than flexible plastics pipes and backfilling can therefore be simpler. The Building Regulations specify the limits of cover for rigid pipes as follows:

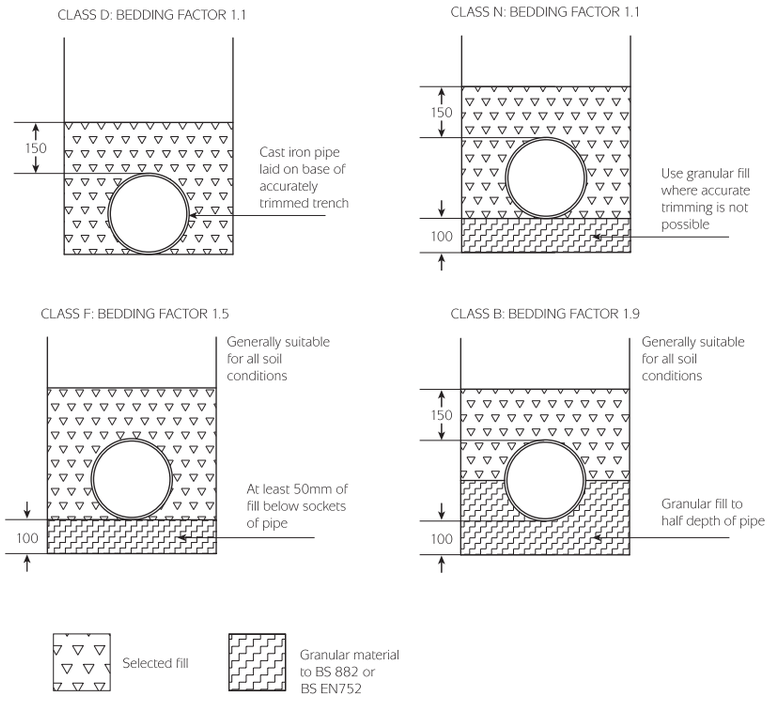
Limits of cover for standard strength rigid pipes in any width of trench (ref BS 8301 now superseded by BS EN 752)

Pipe size	Bedding class	Fields and gardens		Light traffic roads		Heavy traffic roads	
		Min	Max	Min	Max	Min	Max
100	D or N	0.4	4.2	0.7	4.1	0.7	3.7
	F	0.3	5.8	0.5	5.8	0.5	5.5
	B	0.3	7.4	0.4	7.4	0.4	7.2
150	D or N	0.6	2.7	1.1	2.5	–	–
	F	0.6	3.9	0.7	3.8	0.7	3.3
	B	0.6	5.0	0.6	5.0	0.6	4.6

Backfill sequence

Trenches should be backfilled in stages, and at least 150mm of earth free from stones larger than 40mm, lumps of clay over 100mm and vegetable matter should cover the pipe before tamping down. Further 300mm thick layers of selected fill should be tamped down until the trench is full.

Backfilling for rigid pipes



Design recommendations

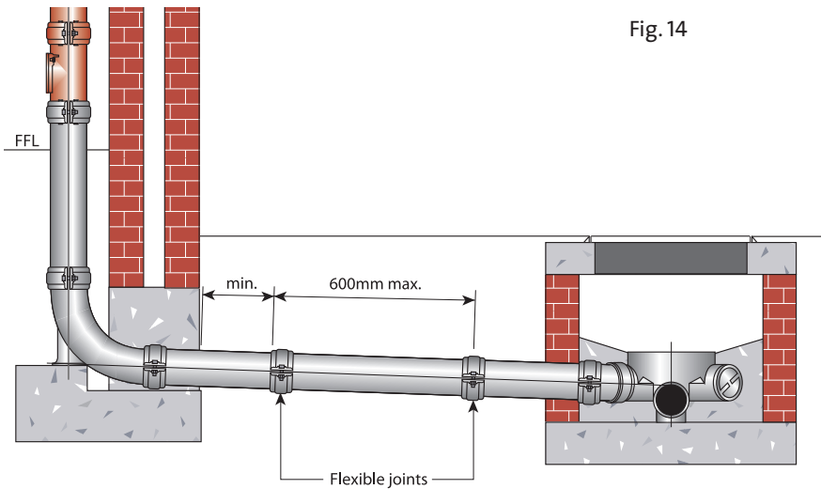


Fig. 14

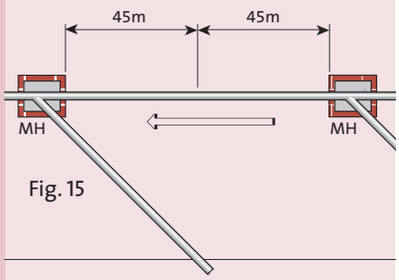


Fig. 15

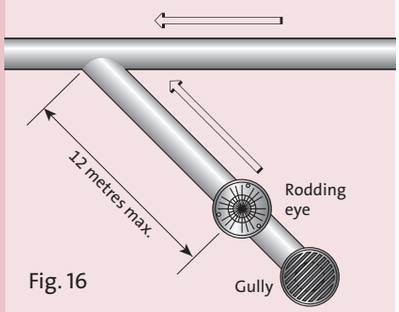


Fig. 16

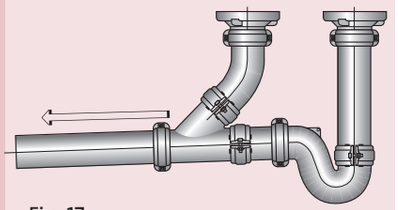


Fig. 17

Access

Access is required on all pipelines to facilitate the rodding and clearing of debris and can be provided by manholes, chambers, access fitting or rodding eye – the latter allowing downstream access only.

Generally, no part of a drain should be further from a manhole than 45 metres and the distance between manholes should not exceed 90 metres. (See Fig. 15)

Where a drain connects with another drain without the provision of an inspection chamber or manhole, access should be provided on the branch drain within 12 metres of the junction. (See Fig. 16 and Fig. 17).

Below is a table of maximum spacing of drainage access points (in metres).
For pipes up to and including 300mm dia.

From		Access-fitting To small	Large	Junction	Inspection Chamber	Manhole
Start of external drain		12	12	–	22	45
Rodding eye		22	22	22	45	45
Access fitting						
Small	150Ø					
	150 x 100			12	22	22
Large	225 x 100			22	45	45
Inspection chamber		22	45	22	45	45
Manhole		22	45	45	45	90

Reference the building regulation 1985 (2000) drainage and waste disposal document H. H1 – sanitary pipework and drainage-table 10.

Design recommendations

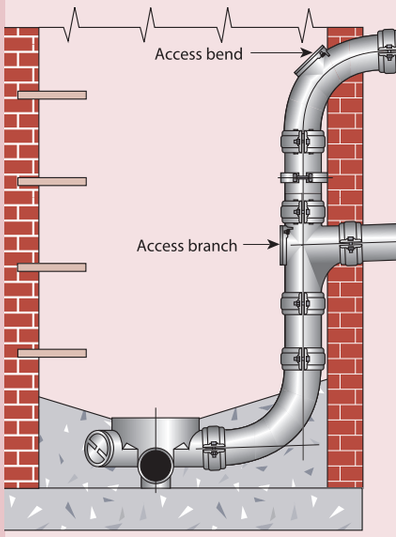


Fig. 18

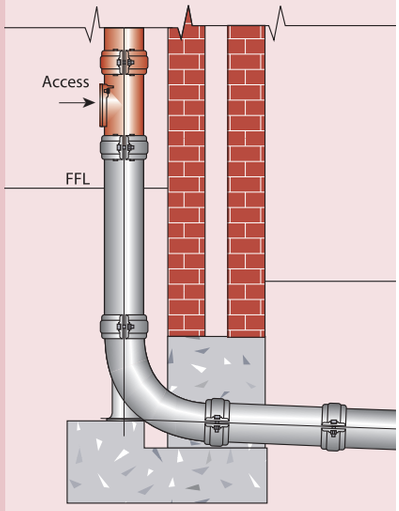


Fig. 19

It is recommended that access to the pipework is installed each time the drain changes direction either horizontally or vertically by the inclusion of an access fitting. (See Fig. 18 and Fig. 19).

Inspection chambers

Inspection chamber branch arm entries are all at 45° to conform with BS EN 12056/4.

Where other angles of entry are necessary these can be achieved by the use of standard bends (See Fig. 20).

Use of bends/branches

Bends in drains should be kept to a minimum. Wherever possible bends should be at or near to manholes or in a position which allow ease of rodding (See Fig. 20).

At the base of soil and rainwater stacks, it is recommended that long radius bends be used (See Fig. 19).

Branches or junctions on drains should be – where possible – at access points, such as manholes, to facilitate rodding.

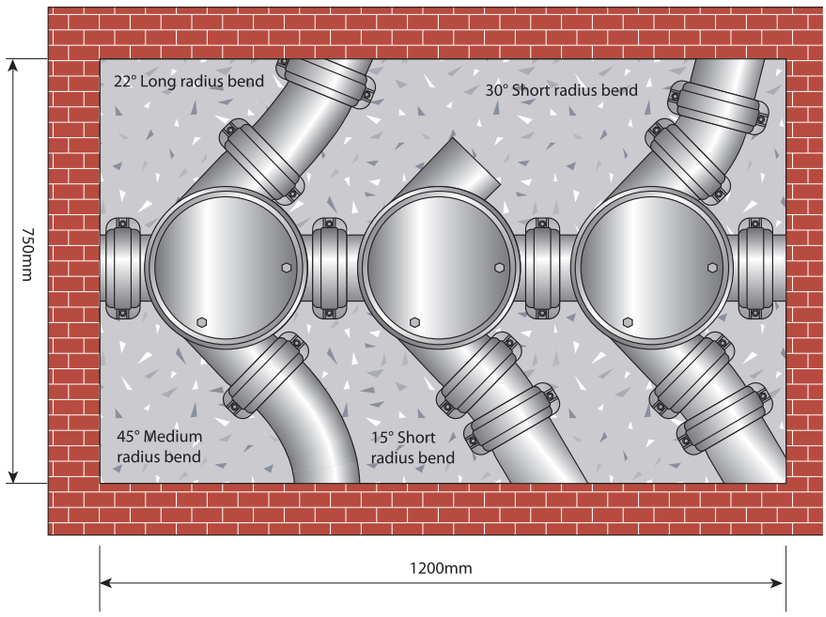


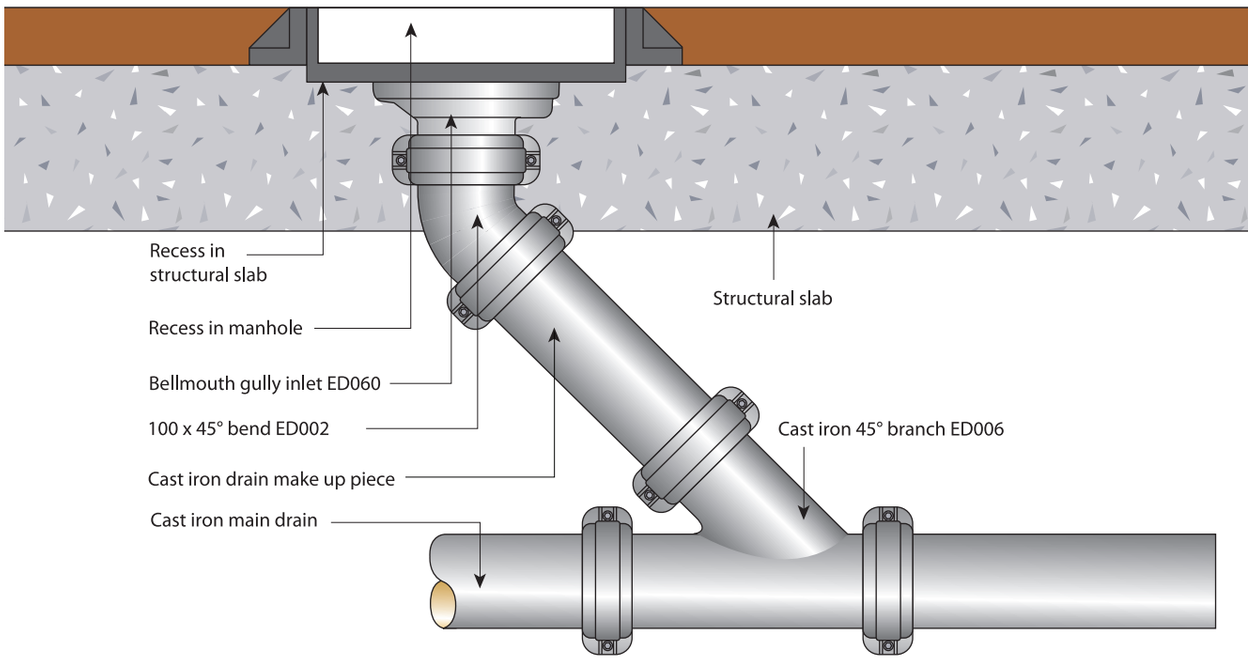
Fig. 20

Design recommendations

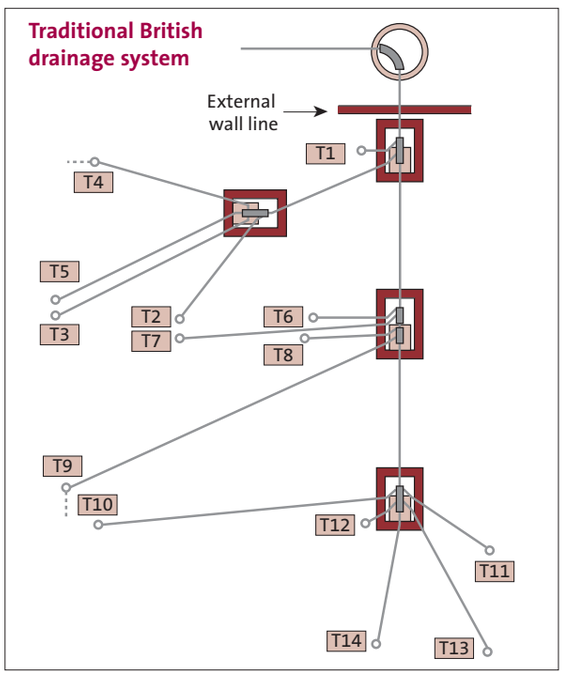
Benefits of rodding point system

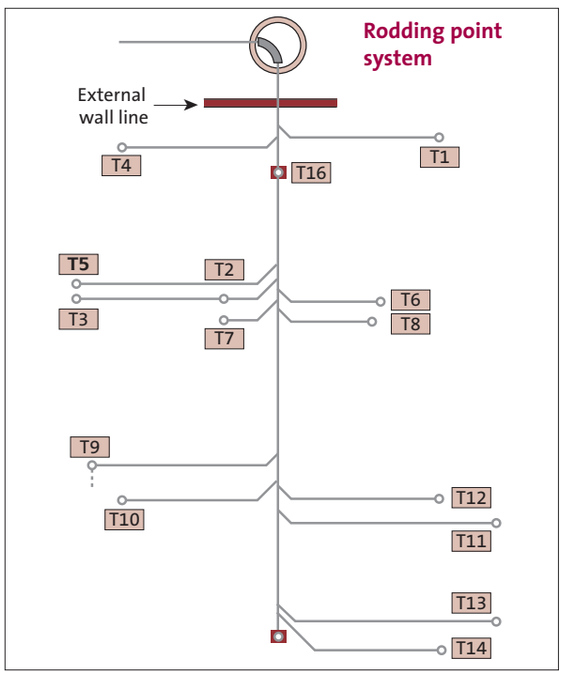
- Rodding blockages to an external manhole for removal is more hygienic
- Quicker to install reducing installation costs
- Construction of manhole brick chambers no longer required
- Allows sectional testing to be carried out during installation
- Removes the problem of running a branch drain between two fixing points reducing the need for many small bends
- Fulfils the requirements of BS EN 12056/4
- Designed to accommodate CCTV surveying

Rodding point with floor cover



A comparison of systems





Puddle flanges installation details

Where pipes pass through external walls, in basement areas, a puddle flange may be required. Location which may be below the water table or in areas liable to flooding or in areas which may need to be sealed against methane gas coming from made up ground etc.

The puddle flange reduces the risk of water entering the building by capillary action when installed in a water retaining structure. In Figure 21 a typical build in detail is shown. The two-piece loose puddle flange is bolted onto the pipe once it has been bedded on Denso tape or similar.

Figure 22 shows a pipe passing through a sleeve. This would be used where pipe work is installed after walls have been constructed. The areas between the pipe and sleeve is sealed using a mastic type sealant.

In Figure 23 we see how the puddle flange is fixed and sealed onto the pipe. With Ensign this type of puddle flange is available as ED078 in 100mm, 150mm, 250mm and 300mm diameters.

Figure 24 shows the build in type again, this time one piece (four set screws) for use with a 200mm pipe. The ED078 is a compression puddle flange which needs to be slipped over the end of the pipe and put into position. Then it can be tightened up with the ratchet wrench. The gasket within the unit is compressed on to the pipe, therefore no Denso tape is required.

Figure 25 you can see that four bolts need to be tightened up equally.

Fig. 21

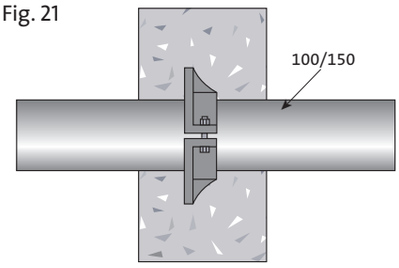
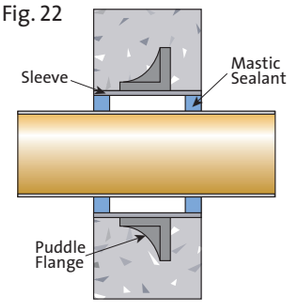


Fig. 22



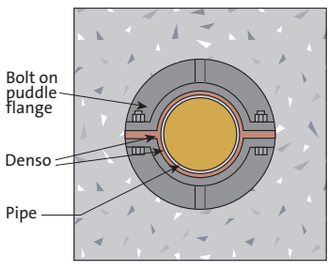
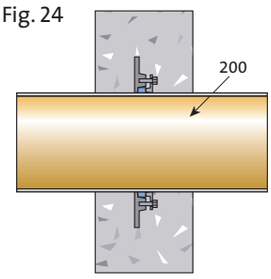


Fig. 23

Fig. 24



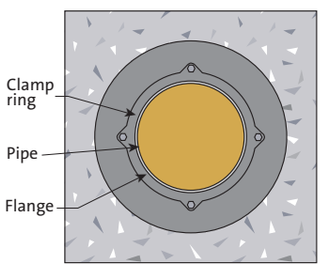


Fig. 25

Timesaver

British Standard fittings

The Timesaver drain range to BS 437 contains many British Standard design fittings – please consult latest Timesaver catalogue for full range:

- Garage gullys
- Bellmouth gully inlets
- Raising pieces
- Running traps

These fittings can be connected to the Ensign drain system using a transitional coupling TD02 *(see page 34)*.

Transitional coupling TD02

BS 437

anti-flooding traps

Saint-Gobain Pipelines manufacture a range of traditional BS 437 fittings – please consult latest Timesaver catalogue for full range:

- Anti-flooding trunks and valves (150mm shown left)
- Anti-flooding ball valves
- Fresh-air inlets
- Intercepting traps
- Petrol interceptive traps

These fittings can be connected to the Ensign drain system using a transitional coupling TD02 (for 150mm eureka anti-flooding trunk valves), or by using a transitional pipe TD47 and with a transitional coupling TD02.