

5.00

INSTALLATION DETAILS

Hunter Underground Systems

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5.01 GENERAL INSTALLATION

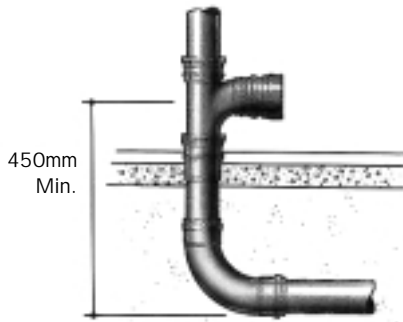
The Hunter PVCu underground drainage system sockets are suitable for connecting to PVCu soil pipes as in the Hunter soil systems which are manufactured to BS EN 1329: 2000/BS 4514: 2001. or any other soil stack system manufactured to the same standard. 110mm 160mm and 200mm pipes are internationally adopted sizes and will connect to systems manufactured to ISO-DIN and other international standards.

The Underground Drainage Socket should be left clear of the finished floor to ensure that the allowance that must be made for expansion is not impeded by the soil pipe being concreted in.

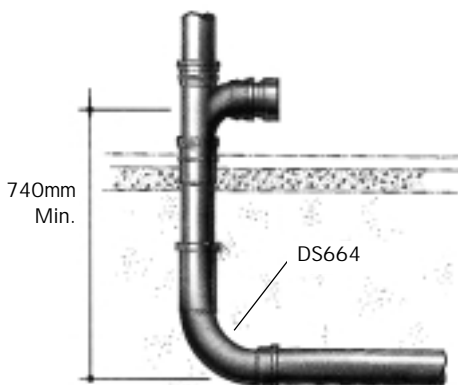
BS Code of Practice B55572: 1978 states that, for the protection of the lowest connection to the soil stack from varying air pressures in the system, the following should be observed:-

5.02 SINGLE DWELLINGS UP TO 3 STOREYS HIGH

Vertical distances between the lowest branch connection to the stack and the invert of the drain must be a minimum of 450mm.



5.03 MULTI DWELLINGS UP TO 5 STOREYS HIGH



NB, The DS664 is ideally suited for use in ground susceptible to settlement and movement.

5.04 NOTES

For soil stacks up to five storeys, the distance between the drain invert and the lowest branch should be a minimum of 740mm. On taller soil stacks connect the ground floor appliance into their own soil stack or make direct connections to the horizontal drain. For buildings higher

than 20 storeys it may be necessary to connect the ground and first floor to their own soil stack.

5.04a JOINTING

Generally, Hunter Underground Drainage Systems are jointed by expansion Ring seals which are incorporated in all pipe and fitting sockets. However, to facilitate the use of short lengths of pipe, loose sockets are supplied. These have expansion ring sockets at one end and solvent cement sockets at the other, although double push-fit sockets and slip couplings are available.

5.05 PUSH-FIT (EXPANSION)

Always check the EPDM seal is positioned correctly in its housing and completely free from dirt, grit or sand and that the pipe spigot is clean and chamfered.

Spigots of stock pipe lengths and all fittings with spigot tail are supplied chamfered. On cut lengths of pipe, a similar chamfer should be filed.

Lubricate evenly around the spigot (not the socket) with Hunter Silicone lubricant code SC960, SC966 or spray SC967.

Push the spigot fully into the socket. Mark the spigot at the socket face and then withdraw the spigot by a minimum of 10mm.

NB: Do not use lubricants made for clay drain as it may cause the seals to be pushed out of their housing.

5.06 SOLVENT WELD CEMENTING

Cut pipe squarely, remove swarf from inner and lightly chamfer outer edges. Lightly abrade pipe and socket with emery cloth then degrease with fresh absorbent paper soaked in cleaning fluid. With a clean brush, quickly apply an even and generous coating of cement to the pipe in a lengthwise direction and then a similar but lighter coat to the fitting.

Immediately push together to the full depth, without twisting. Hold for 20 - 30 seconds and clean off excess adhesive. Allow (at least) 10 minutes before handling, then a further 8 hours before putting into service. To prevent the adhesive becoming unusable, reseal the can immediately after use. Under no circumstances mix with cleaning fluids, nor dip the pipe into the glue.

5.07 STORAGE AND SHELF LIFE

Solvent cement has a shelf life of 12 months when stored in a sealed container between 5°C and 30°C. It is recommended that this product be stored under cover and in a dry area.

GENERAL INFORMATION ON JOINTING - REFERS TO 5.04 TO 5.06

CLEANING FLUID

To clean all PVCu pipe and fittings before using solvent cement, available in 125ml cans SC950.

SOLVENT CEMENT

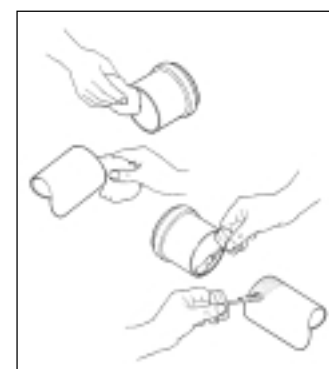
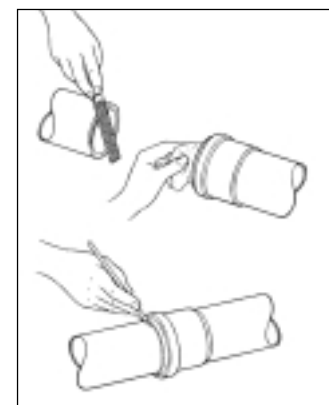
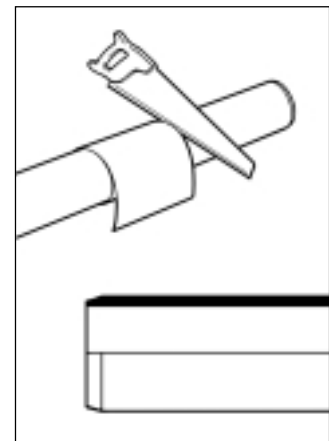
To joint all PVCu pipe and fittings. Available in 125ml cans SC953 and 250ml cans SC954. (To BS 6209).

LUBRICANT

To lubricate pipe and ring seal joints prior to assembly. Available in 30ml tubes SC960, 250ml tubes SC966 and 300ml aerosol spray SC967.

The table below indicates the approximate number of joints which can be made (allowing for wastage) with the standard size lubricant cleaning fluid and solvent cement.

PIPE SIZE AND NUMBER OF JOINTS		
	110mm	160mm
CLEANER		
125ml	20	10
CEMENT		
125ml	7	3
250ml	15	7
LUBRICANT		
30ml	30	20
250ml	150	100



Note: Allow 250ml lubricant values for 300ml silicone spray

Cutting pipe

Use a fine tooth hand saw. All pipe must be cut square.

Chamfering pipe

Use a medium file or rasp to remove swarf. Ends of pipe must be Chamfered to approximately 45° for 2/3rds wall thickness.

Pipe chamfering tools

The use of a pipe chamfer tool is recommended to obtain the correct shape and angle of chamfer.

5.08

Trench Preparation and Pipe Laying

TRENCH PREPARATION

The trench should not be opened too long in advance of pipe laying and should be backfilled as soon as possible. It is essential to ensure that the sides of the trenches are adequately supported. To minimise a possible hazard, a trench should be open for the minimum time practicable.

At the crown of the pipe and for 300mm, or one pipe diameter if greater, above it the width of the trench within any timbering should be as narrow as is practicable, but not less than the outside diameter of the pipe plus sufficient extra width (usually about 150mm) on each side of the pipe to provide access for making the joints and placing and compacting sidefill. Above this level, the trench may be of any convenient width.

If the "as-dug" material is suitable for use as bedding, the bottom of the trench may be trimmed to form the pipe bed. otherwise, the trench should be excavated to an adequate depth below the invert level of the pipe to allow for the necessary thickness of bedding material. The thickness of bedding under the barrel of the pipes should be a minimum of 100mm, but in very wet or soft conditions or where the trench bottom is very irregular, it may be necessary to increase this thickness. Bedding should be properly compacted and finished so as to provide uniform support for the pipe. It is essential that bricks or other hard materials are not placed under the pipes for temporary or permanent support.

Material to be used for bedding and surrounding the pipes should be selected granular material, either available locally or, if necessary, brought to the site. Suitable materials are described in Table 1*.

Alternatively, granular material in accordance with the recommendations of Appendix A and having a particle size not exceeding that specified in Table I*, depending on pipe size, may be used.

PIPE LAYING

The pipes should be jointed in the trench and laid on the prepared bed so that the barrel of the pipe maintains substantially continuous contact. Small depressions should be made to accommodate the pipe sockets or couplings, which should be carefully filled after the pipe has been laid, taking care that no voids remain under or around the socket. Traffic, including heavy construction vehicles, should not be allowed to pass over pipes which have less than 0.9m of cover, unless suitable protection is provided.

Care should be taken to prevent pipes from deviating from their designed level and line due to flotation prior to backfilling. Any struts used for this purpose should be removed as backfilling proceeds.

Where a pipe is required to go through the wall or foundation of a building or other rigid structure other than at an inspection chamber or manhole, a sleeve should be built into the wall or structure. The inside sleeve diameter should be not less than the outside diameter of the pipe plus 50mm. The annular space between pipe and sleeve should be stopped with a suitable material which is compatible with the pipe material and which should be non-hardening non-racking and resistant to moisture and gas. Pipe joints should not occur within the sleeve.

Alternatively, a lintel or relieving arch may be formed in the structure to leave 50mm all round the pipe which should be filled as indicated above. The opening should also be masked with rigid sheet material to prevent ingress of fill or vermin.

Where a pipe passes through a wall at a point below the level of the natural water table, a puddle-flanged pipe or a purpose-made PVCu wall protection sleeve should be used to prevent ingress of water.

The provision of at least one flexible joint is recommended within 150mm of the external face of the wall, footing or ground beam, of any building and at each entry or exit point of all manholes and inspection chambers. Where abnormal settlement is expected, it is desirable to incorporate two flexible joints to form a 'rocker' length of pipe. See diagram 7 on page 15 of the Approved Document H, of the Building Regulations 2000.

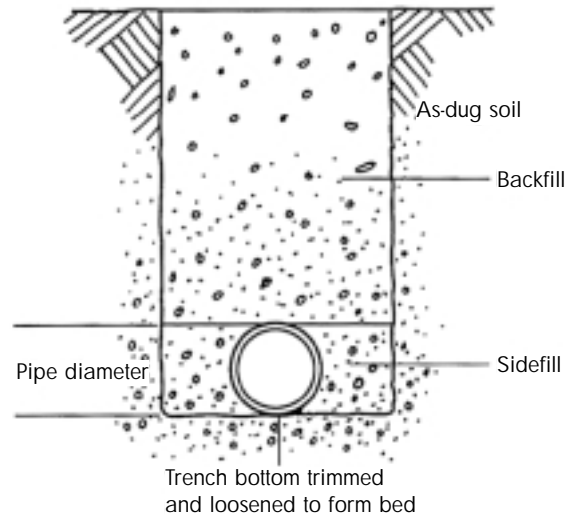
5.09

Bedding and Backfilling Procedures

5.09 BEDDING AND BACKFILLING PROCEDURES

PVCu drainpipes and fittings produced in accordance with BS EN 1401-1: 1998 and with BS4660: 1989 should be installed in accordance with:

- BS EN 1295-1: 1998 structural design of buried pipelines under various conditions of loading
- BS EN 1610: 1998 construction and testing of drains and sewers
- BS 8000:14: 1989 workmanship on building sites. Code of practice for below ground drainage
- BS EN 752: Drain and Sewer systems outside buildings
- Approved Document Part H of the Building Regulations 2002 edition



Note: As-dug soil, sidefill and backfill to be granular material as defined in Appendix A.

LAYING PIPES

ON TRENCH BOTTOM IN GRANULAR MATERIAL

Where the as-dug material is suitable for use as bedding, the bottom of the trench may be trimmed to form the pipe bed.

Suitable material is defined as granular material in accordance with the recommendations of Appendix A. Imported material must comply with Table 1 shown below having a nominal particle size not exceeding 10mm or 14mm for 110mm and 160mm diameter pipes respectively.

Small depressions should be made to accommodate the pipe sockets or couplings. After the pipe has been laid these should be carefully filled to ensure that no voids remain under, or around, the socket.

When the formation is prepared, the pipes should be laid upon it true to line and level within the specified tolerances. Each pipe should be checked and any necessary adjustments to level made by raising or lowering the formation, ensuring that the pipes finally rest evenly on the adjusted formation throughout the length of the barrels. It is crucial that bricks or other hard materials are not placed under the pipes for temporary or permanent support.

Where the formation is low and does not provide continuous support, it should be brought up to the correct level by placing and compacting suitable material.

IMPORTED BEDDING MATERIALS

Where the as-dug material is not suitable for use as bedding, sidefill or backfill, imported material complying with the table below may be used.

Table 1

SUITABLE IMPORTED MATERIALS FOR BEDDING AND SURROUNDING PVCu DRAIN PIPES	
Pipe size in millimetres	Material (complying with the requirement of BS EN 12620: 2000)
110	10, nominal single-sized aggregate
160	10 or 14, nominal single-sized aggregate or 14 to 5 graded aggregate
225 and over	10, 14 or 20 nominal single-sized aggregate, or 14 to 5 or 20 to 5 graded aggregate

Alternatively, granular material in accordance with the recommendations of appendix A and having a particle size not exceeding that specified above, depending on pipe size may be used.

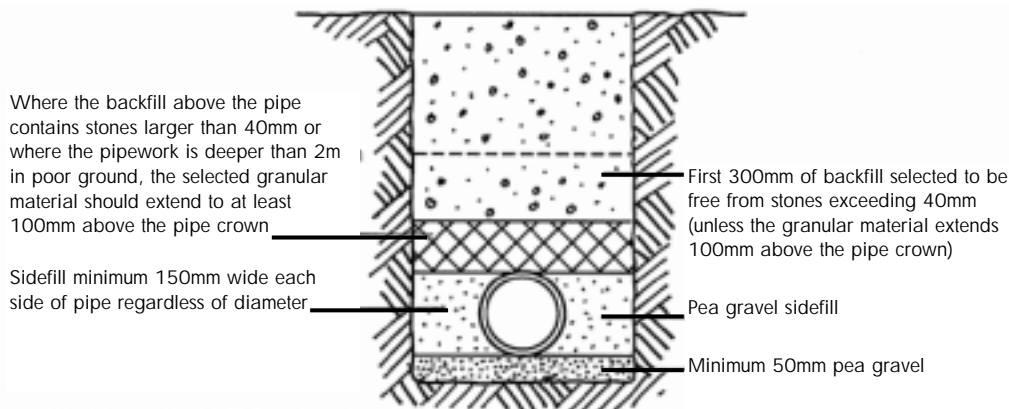
ON GRANULAR BEDS

When the as-dug material is not suitable as bedding, a layer of suitable granular material must be spread evenly on the trimmed trench bottom before the pipes are installed. The trench should be excavated to allow for the thickness of granular bedding under the barrels.

The trench formation should be prepared, the bedding placed and the pipes laid in accordance with the current standards.

Where the as-dug material can be hand trimmed by shovel and is not puddled when walked upon, a 50mm depth of bedding material may be used. In this case the material must be nominal 10mm single-sized aggregate with no sharp edges, i.e., pea gravel, for 110mm pipe. For 160mm pipe 10 or 14 nominal - single-sized aggregate.

PIPES LAID ON 50MM MINIMUM GRANULAR BEDDING

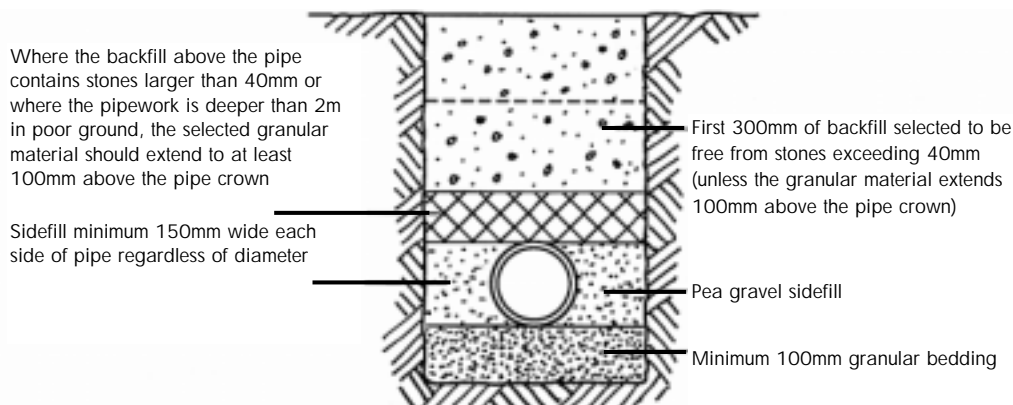


When the pipes are to be laid in rock, compacted sand and gravel requiring mechanical means of trimming, but in soft or very wet ground, the bedding should be a minimum of 100mm or where the trench bottom is very irregular, it may be necessary to increase this thickness.

SIDEFILL AND BACKFILL

After the pipes have been laid and tested, more of the selected granular material should be placed evenly on both sides of the pipes up to a level above the pipe crown and compacted. Pipes larger than 315mm may require an intermediate stage of compaction. If the main backfill over the pipes is liable to contain particles exceeding 40mm, or where the trench is deeper than 2m to 3m in unstable soil, the granular material should extend to at least 100mm above the pipe crown. Any trench supports should be withdrawn in stages so that the sidefill can be properly compacted between the pipe and the trench walls. In all cases material should be worked under the sides of the pipes to eliminate voids as much as possible.

It may be advantageous, if the pipes are tested by water pressure, to carry out the backfilling operation with the pipes full of water. Unless otherwise specified or the statutory authorities require a different material, the material excavated from the trench may be used for the remainder of the backfill, but if the granular material does not extend to at least 100mm above the pipe crown the first 300mm layers or in compliance with the requirements of statutory authorities. Heavy compactors should not be used until the pipes have at least 300mm of cover, but suitable light vibratory tampers may be used with discretion at any stage of the work to aid compaction.



PIPES LAID ON 100MM MINIMUM PEA GRAVEL BEDDING

APPENDIX A

TESTS FOR SUITABILITY OF SOIL OR GRANULAR MATERIAL FOR USE IN BEDDING AND BACKFILLING AROUND HUNTER PVCu UNDERGROUND DRAINAGE PIPES

TEST FOR PARTICLE SIZE

The maximum particle size should generally not exceed 20mm. The presence of an occasional particle between 40mm and 20mm is acceptable, provided the total quantity of such particles is only a very small fraction of the whole. When particles over 40mm are present the material should be rejected. If in doubt take a representative sample, about 50kg of the proposed material, which should then be heaped on a clean surface and divided into two halves. One of these should then be similarly divided, and so on until the required sample, weighing about 2kg, is left.

The sample is then sieved using 38mm and 19mm nominal mesh size (BS410) and if any particles are retained on the 38mm sieve, or more than 5% by weight of the sample is retained on the 19mm sieve, the material is not acceptable, unless it is first screened so as to comply with this requirement.

During the sieving operation, clumps of material that break up under light finger pressure may be helped through the sieve, but considerable force must not be used to squeeze oversize clumps through the mesh.



TEST FOR EASE OF COMPACTION

Apparatus required:

Open-ended cylinder 250mm long and 150mm \pm 6mm internal diameter (160mm outside diameter PVCu pipe is suitable)

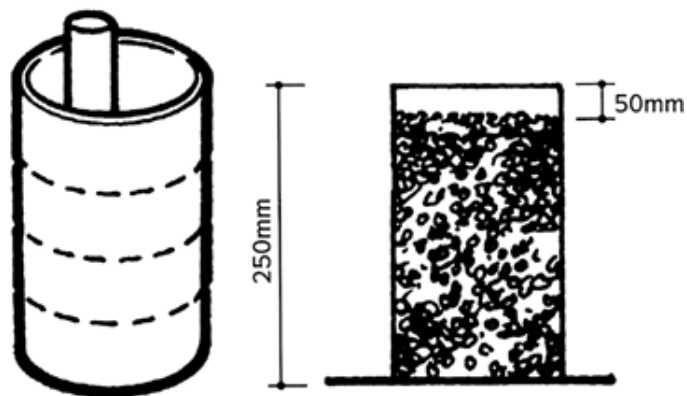
Metal rammer with striking face 40mm diameter and weighing 1.0 \pm 0.1kg.

Procedure:

Having established that the particle size is satisfactory, obtain a representative sample of the material. This should be more than sufficient to fill the cylinder, and weigh about 11kg. It is important that the moisture content of the sample should not differ materially from that of the bulk of bedding material at the time of its use in the trench.

Then:

1. Place the cylinder on a flat firm surface and gently pour the sample material into it. loosely and without tamping
2. Strike off the surface level with the top of the cylinder and remove all surplus material
3. Lift the cylinder up clear of its contents and place on a fresh area of flat surface
4. Place about one quarter of the material back in the cylinder and tamp vigorously until no further compaction can be obtained. Repeat with the second quarter, tamping as before, and so on for the third and fourth quarters, tamping the final surface as level as possible.
5. Measure down from the top of the cylinder to the surface of the compacted material. The distance in the example is 50mm and when this is divided by the height of the cylinder (250mm) the compaction fraction is obtained, The following table shows how the compaction fraction provides a guide to the suitability for use of bedding materials.



INTERPRETATION OF THE RESULTS	
Compaction fraction	Suitability for use
0.20 or less (50mm)	Material is suitable for use
0.20 to 0.3 (50 to 75mm)	Material may be suitable for applications other than installations carried out in compliance with the Civil Engineering Specification for the water industry but requires extra care in compaction. Not suitable if the ground is subject to waterlogged conditions after laying.
More than 0.3 (75 mm)	Material is unsuitable for use.

5.10

Bedding and Backfilling PVCu Drains under Buildings

5.10 BEDDING AND BACKFILLING PVCu DRAINS UNDER BUILDINGS

PVCu pipes do not fracture under load but are liable to deformation. The extent of the deformation depends largely upon the compaction of the immediate surrounding fill. For this reason they should be surrounded with material in accordance with appendix A or table one (see earlier information).

When pipes are laid under buildings the rigidity of a concrete bed and surround may be undesirable and in this case only single sized aggregate or material having a compaction fraction of 0.2 or less, when tested in the manner described in appendix A should be used. The surround and backfill should be continued with similar material up to the underside of the oversite concrete ensuring a minimum granular surround of 100mm..

This fill should extend to the trench width and be properly compacted in order to prevent excessive deformation. The use of selected material avoids sharp objects such as large stones or flints that would damage the pipe. Bedding of the pipe should conform to the earlier bedding details.

5.11

Bedding and Backfilling PVCu Drains at Shallow Depths

5.11 BEDDING AND BACKFILLING PVCu DRAINS AT SHALLOW DEPTHS

Traffic including heavy construction vehicles, should not be allowed to pass over pipes that have less than 900mm of cover, unless suitable protection is provided. Where this is unavoidable surround should conform to figure 3 and 4 (see drawings on the following page). However, when this situation is temporary such as before the final surface has been constructed, bridging the trench with steel plates, timber sleepers or other temporary protection of suitable strength can prevent unavoidable site traffic deforming the pipe.

If concrete is to be used as a surround, bear in mind that as it sets it gives off heat that may cause the pipe to deform. If pipes must be surrounded with concrete, make sure they do not float when the concrete is poured. Filling the pipes with water should provide enough ballast but side restraint may be needed to maintain alignment. However, avoid the use of sharp objects such as bricks or large stones that would damage the pipe. To insure a certain degree of flexibility is maintained, use 13mm fibreboard or polystyrene sheet at the joints. They should be the width and height of the concrete surround. Wrap the joints with polythene sheet to protect it from ingress of concrete.

5.11

Bedding and Backfilling PVCu Drains at Shallow Depths cont-

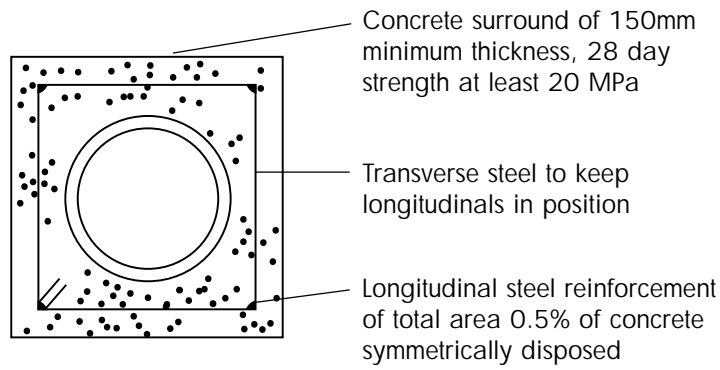


Figure 3 Details of concrete surround

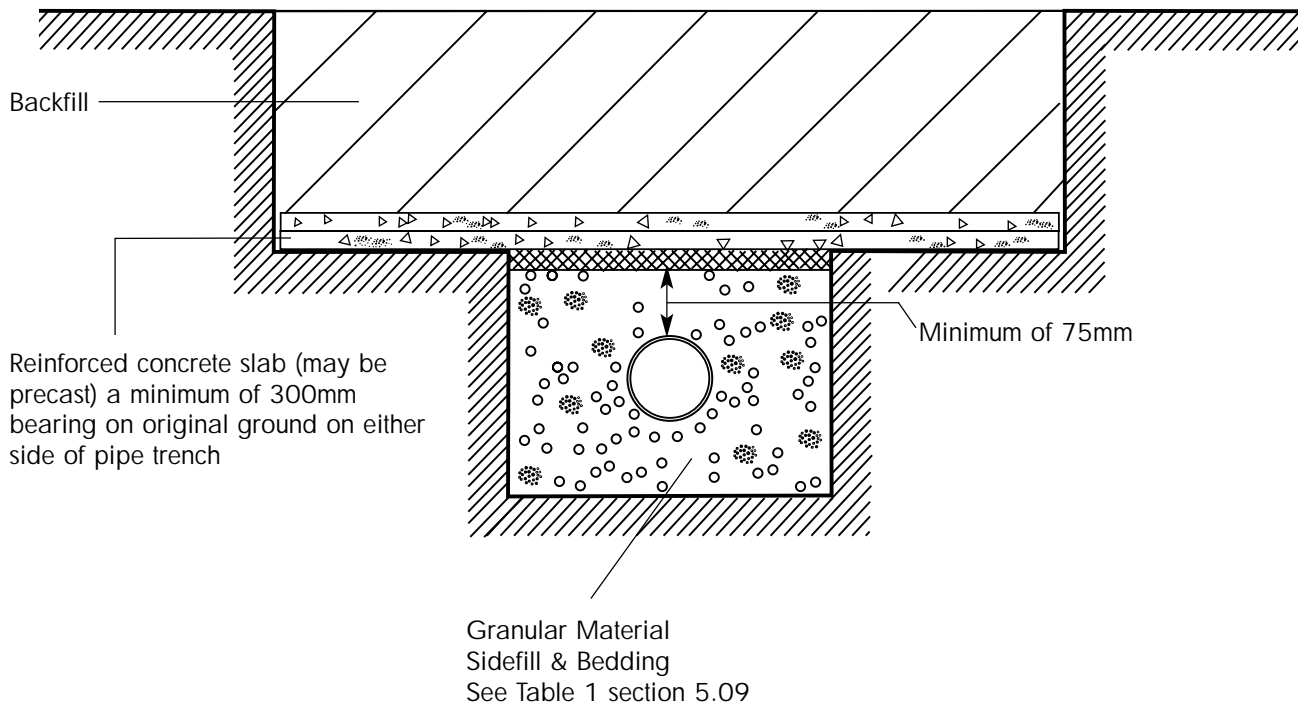


Figure 4 Alternative to concrete surround as shown in figure 3