

Building Regulations 1997

Technical Guidance Document H

Drainage and Waste Water Disposal

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Amendments issued since publication

Technical Guidance Document H - Drainage and Waste Water Disposal

Amd. No.	Text Affected
H(i)	Transitional Arrangements:- Replace 1 January 1998 with 1 July 1998
H(ii)	<p>Table 7 delete reference to rigid asbestos cement pipes and replace with:</p> <p>“fibre cement to I.S. EN 588-1”.</p> <p>replace list of standards covering rigid concrete pipes with:</p> <p>“I.S. 6, BS 5911 and for surface water drainage only, I.S. 166.”</p>
H(iii)	<p>Key to Diagrams 7 & 8 replace description of granular material with:</p> <p>“should be 10mm aggregate conforming to I.S. 5: 1990 having a compaction fraction of 0.2 or less when tested in accordance with BS 8310: 1985 Appendix D”.</p>
H(iv)	<p>Table 9 alter the minimum diameter for circular manholes for a depth of 1.5 m or less to:</p> <p>“1000”.</p>
H(v)	<p>Standard and other references delete reference to I.S. 243 and BS 3656 and insert:</p> <p>“I.S. EN 588-1: 1997, Fibre-cement pipes for sewers and drains - Part I: Pipes, joints and fittings for gravity system.”</p>

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Building Regulations, 1997

Technical Guidance Document H

Drainage and Waste Water Disposal

Introduction

This document has been published by the Minister for the Environment under article 7 of the Building Regulations, 1997. It provides guidance in relation to Part H of the Second Schedule to the Regulations. The document should be read in conjunction with the Building Regulations, 1997, and other documents published under these Regulations.

In general, Building Regulations apply to the construction of new buildings and to extensions and material alterations to buildings. In addition, certain parts of the Regulations apply to existing buildings where a material change of use takes place. Otherwise, Building Regulations do not apply to buildings constructed prior to 1 June, 1992.

Transitional Arrangements

In general, this document applies to works, or buildings in which a material change of use takes place, where the works or the change of use commence or takes place, as the case may be on or after 1 July, 1998. Technical Guidance Document H - **Drainage and Waste Water Disposal**, dated 1991, also ceases to have effect from that date. However, the latter document may continue to be used in the case of works, or buildings in which a material change of use takes place -

- where the works or the change of use commence or takes place, as the case may be, before 1 July, 1998,
- in respect of which a Fire Safety Certificate under the Building Control Regulations, 1991 to 1994, has been granted, where the works or change of use commence or takes place, as the case may be, not later than 31 December, 2002.

The Guidance

The materials, methods of construction, standards and other specifications (including technical specifications) which are referred to in this document are those which are likely to be suitable for the purposes of the Regulations. Where works are carried out in accordance with the guidance in this document, this will, prima facie, indicate compliance with Part H of the Second Schedule to the Building Regulations. However, the adoption of an approach other than that outlined in the guidance is not precluded provided that the relevant requirements of the Regulations are complied with. Those involved in the design and construction of a building may be required by the relevant building control authority to provide such evidence as is necessary to establish that the requirements of the Building Regulations are being complied with.

Existing Buildings

In the case of material alterations or changes of use of existing buildings, the adoption without modification of the guidance in this document may not, in all circumstances, be appropriate. In particular, the adherence to guidance, including codes, standards or technical specifications, intended for application to new work may be unduly restrictive or impracticable. Buildings of architectural or historical interest are especially likely to give rise to such circumstances. In these situations, alternative approaches based on the principles contained in the document may be more relevant and should be considered.

Technical Specifications

Building Regulations are made for specific purposes, e.g. to provide, in relation to buildings, for the health, safety and welfare of persons, the conservation of energy and access for disabled persons. Technical specifications (including harmonised European Standards, European Technical Approvals, National Standards and Agrément Certificates) are relevant to the extent that they relate to these considerations. Any reference to a technical specification is a reference to so much of the specification as is relevant in the context in which it arises. Technical specifications may also address other aspects not covered by the Regulations.

A reference to a technical specification is to the latest edition (including any amendments, supplements or addenda) current at the date of publication of this Technical Guidance Document. However, if this version of the technical specification is subsequently revised or updated by the issuing body, the new version may be used as a source of guidance provided that it continues to address the relevant requirements of the Regulations.

Materials and Workmanship

Under Part D of the Second Schedule to the Building Regulations, building work to which the Regulations apply must be carried out with proper materials and in a workmanlike manner. Guidance in relation to compliance with Part D is contained in Technical Guidance Document D.

Interpretation

In this document, a reference to a section, sub-section, part, paragraph or diagram is, unless otherwise stated, a reference to a section, sub-section, part, paragraph or diagram, as the case may be, of this document. A reference to another Technical Guidance Document is a reference to the latest edition of a document published by the Department of the Environment under article 7 of the Building Regulations, 1997. Diagrams are used in this document to illustrate particular aspects of construction - they may not show all the details of construction.

Drainage and Waste Water Disposal

Building Regulations - The Requirement

Part H of the Second Schedule to the Building Regulations, 1997, provides as follows for the disposal of foul and surface water :-

Drainage systems.	H1	(1)	A building shall be provided with such a drainage system as may be necessary for the hygienic and adequate disposal of foul water from the building.
		(2)	A building shall be provided with such a drainage system as may be necessary for the adequate disposal of surface water from the building.
		(3)	No part of a drainage system conveying foul water shall be connected to a sewer reserved for surface water and no part of a drainage system conveying surface water shall be connected to a sewer reserved for foul water.
Septic tanks.	H2		A septic tank shall be - (a) of adequate capacity and so constructed that it is impermeable to liquids; (b) adequately ventilated; and (c) so sited and constructed that - (i) it is not prejudicial to the health of any person, (ii) it does not pollute, so as to endanger public health, any water (including ground water) which is used as a source of supply for human consumption, and (iii) there are adequate means of access for emptying.
Definitions for this Part.	H3		In this Part - "combined drain" has the same meaning as in Section 10 of the Local Government (Sanitary Services) Act, 1948 (No. 3 of 1948); "drain" in relation to a building means any pipe, forming part of the drainage system of the building, which is either - (a) wholly underground, or (b) a continuation, in the direction of flow, of part of a drainage system that has been underground, and includes a "combined drain"; "drainage system", in relation to a building, means the system of pipes and drains used for the drainage of the building, including all other fittings, appliances and equipment so used but excluding subsoil water drains; "foul water" means any water contaminated by soil water, waste water or trade effluent; "sewer" has the same meaning as in the Local Government (Sanitary Services) Acts, 1878 to 1964; "soil water" means water containing excreted matter, whether human or animal; "surface water" means the run-off of rainwater from roofs and any paved ground surface around the building; "trade effluent" means effluent from any works, apparatus, plant or drainage pipe used for the disposal to waters or to a sewer of any liquid (whether treated or untreated), either with or without particles of matter in suspension therein, which is discharged from premises used for carrying on any trade or industry (including mining), but does not include domestic sewage or surface water; "waste water" means used water not being soil water or trade effluent.

This Technical Guidance Document is divided into two sections.

Section 1 relates to the requirement in H1 (Drainage Systems).

Section 2 relates to the requirement in H2 (Septic Tanks).

It is important to note that there are other legislative requirements relating to disposal of effluent and the relevant legislation should be consulted.

Section I

Drainage Systems

Drainage systems.	HI	(1)	A building shall be provided with such a drainage system as may be necessary for the hygienic and adequate disposal of foul water from the building.
		(2)	A building shall be provided with such a drainage system as may be necessary for the adequate disposal of surface water from the building.
		(3)	No part of a drainage system conveying foul water shall be connected to a sewer reserved for surface water and no part of a drainage system conveying surface water shall be connected to a sewer reserved for foul water.

Sub-section I.1 General

Guidance

I.1.1 This Section of the Document gives some guidance on good practice in relation to non-complex drainage systems.

Further guidance is contained in the following standards:

BS 5572 : 1994 Code of practice for sanitary pipework

BS 6367 : 1983 Code of practice for drainage of roofs and paved areas

BS 8301 : 1985 Code of practice for building drainage

Where a building is being extended and the extension is to be built over or in close proximity to a drain/combined drain, the building control authority should be consulted - so that the work can be carried out without endangering the integrity of the drain or limiting access to the drain for the purposes of inspection or maintenance.

I.1.2 In this Section

“combined drain” means a single private drain used for the drainage of two or more separate premises (i.e. as defined in Section 10 of the Local Government (Sanitary Services) Act, 1948 (No. 3 of 1948);

“branch pipe” means a discharge pipe connecting sanitary appliances to a discharge stack;

“branch ventilation pipe” means a ventilating pipe connected to a branch pipe;

I.1.3 The pipe sizes quoted in this Section are nominal sizes used as a numerical designation in convenient round numbers approximately equal to a manufacturer’s size. Equivalent pipe sizes for individual pipe standards will be found in BS 5572 for sanitary pipework and BS 8301 for building drainage.

Foul Water Drainage

I.1.4 A foul water drainage system should

- (a) convey the flow of foul water to a foul water outfall (a foul or combined sewer or a septic tank),
- (b) minimise the risk of blockage or leakage,
- (c) prevent foul air from the drainage system from entering the building under working conditions,
- (d) be ventilated to prevent the build up of gases,
- (e) be accessible for clearing blockages, and
- (f) be adequately protected from accidental damage from sources such as traffic, ground settlement and tree roots.

I.1.5 The capacity of the foul water drainage system should be large enough to carry the expected flow at any point (see also par. I.4.1).

1.1.6 The capacity depends on the size and gradient of the pipes. Minimum sizes and gradient limits are given in pars. 1.3.10 to 1.3.13.

1.1.7 The flow depends on the type, number and grouping of appliances.

1.1.8 Appliances are seldom in use simultaneously and the minimum stack and drain sizes in normal use are capable of carrying the flow from large numbers of appliances. Table 1 shows approximate flow rates for numbers of dwellings based on the typical household group of 1 wc, 1 bath, 1 or 2 washbasins and 1 sink used for design purposes in BS 5572.

Number of dwellings	Flow rate (litres/sec)
1	2.5
5	3.5
10	4.1
15	4.6
20	5.1
25	5.4
30	5.8

Surface Water Drainage

1.1.9 A surface water drainage system should

- (a) carry the flow of rainwater from the roof to an outfall (a surface water or combined sewer, a soakaway, or a watercourse),
- (b) minimise the risk of blockage or leakage,
- (c) be accessible for clearing blockages,
- (d) be adequately protected from accidental damage from sources such as traffic, ground settlement and tree roots, and
- (e) be adequately protected from accidental pollution by means of a discharge from foul drains, oil spillage or other pollution sources.

1.1.10 The flow depends on the area to be drained and the intensity of the rainfall which should be assumed to be 75 mm per hour for roof drainage design.

1.1.11 The capacity of the surface water drainage system should be large enough to carry the expected flow at any point in the system.

1.1.12 The capacity depends on the size and gradient of the gutters and pipes. Capacities and minimum sizes are given in sub-section 1.5.

1.1.13 Rainwater or surface water should not be discharged to a septic tank.

Sub-section 1.2 Foul Water Drainage - Pipework Overground

Traps

1.2.1 All points of discharge into the system should be fitted with a water seal (trap) to prevent foul air from the system entering the building. Under working and test conditions, traps should retain a minimum seal of 25 mm.

1.2.2 Table 2 gives minimum trap sizes and seal depths for the appliances which are most used (for other appliances see par. 1.4.2).

Ventilation

1.2.3 To prevent the water seal from being broken by the pressures which can develop in the system, branch pipes should be designed as described in pars. 1.2.5 to 1.2.20.

Appliance	Diameter of trap (mm)	Depth of Seal (mm)
washbasin bidet	32	75
sink* bath* shower* food waste disposal unit urinal bowl	40	75
wc pan	(min dimension) 100	50

* Where these appliances are installed on a ground floor and discharge to a gully, the depth of seal may be reduced to not less than 40 mm.

Access for Clearing Blockages

1.2.4 If a trap forms part of an appliance, the appliance should be removable. All other traps should be fitted directly after the appliance and should be removable or be fitted with a cleaning eye.

Branch Pipes

1.2.5 Branch pipes should discharge into another branch pipe, or a discharge stack, unless the appliances are on the ground floor.

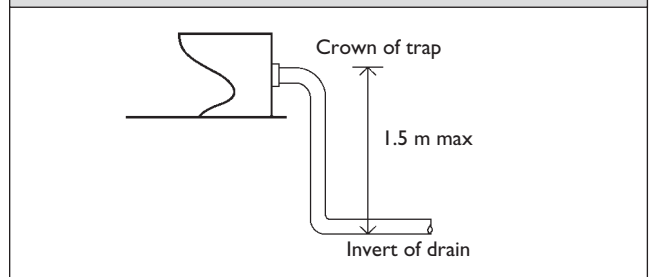
1.2.6 If the appliances are on the ground floor, the branch pipe(s) may discharge to a discharge stack or directly to a drain, or, if the pipe carries only waste water, to a gully (see par. 1.2.9).

1.2.7 A branch pipe should not discharge into a stack in a way which could cause crossflow into any other branch pipe (see Diagram 1).

1.2.8 A branch pipe should not discharge into a stack at a point lower than 450 mm above the invert of the tail of the bend at the foot of the stack in single dwellings of up to three storeys (see Diagram 1). For larger buildings, see pars. 1.4.3 and 1.4.4.

1.2.9 A branch pipe from a ground floor water closet should only discharge directly to a drain if the drop is 1.5 m or less (see Diagram 2). Where the drop is more than 1.5 m, the branch pipe should discharge into a ventilated discharge stack.

Diagram 2 Direct connection of ground floor wc to a drain Par. 1.2.9



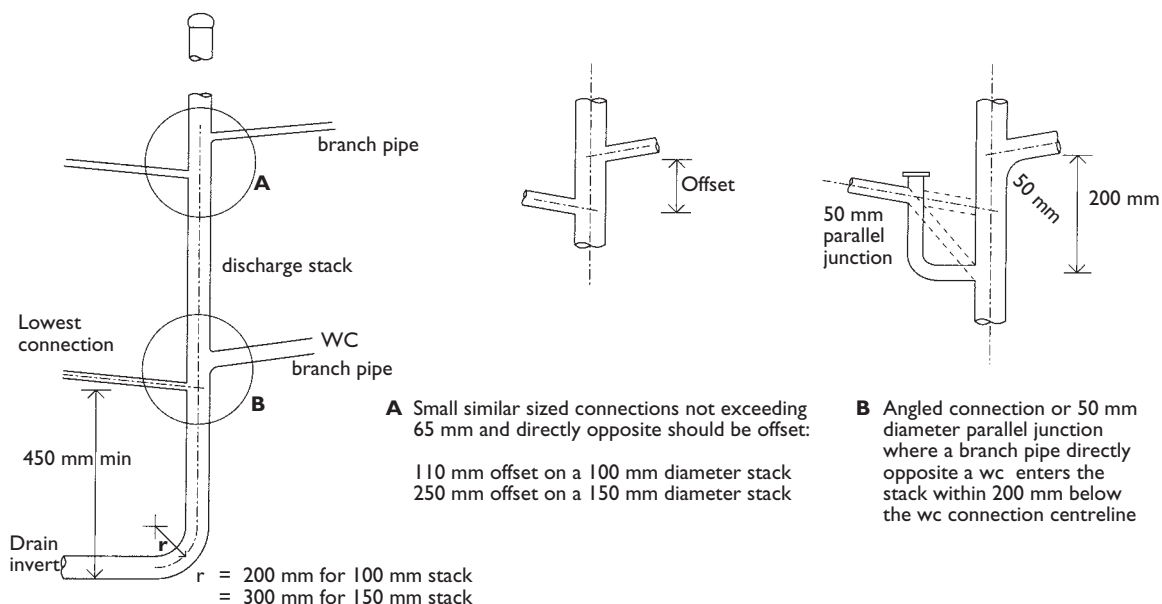
1.2.10 A branch pipe discharging to a gully should terminate between the grating or sealing plate and the top of the water seal.

Sizes of Branch Pipes

1.2.11 Pipes serving a single appliance should have at least the same diameter as the appliance trap (see Table 2). If a pipe serves more than one appliance and is unventilated, the diameter should be at least the size shown in Table 3.

Diagram 1 Branch connections to stacks

Par. 1.2.7



1.2.12 Bends in branch pipes should be avoided if possible but where they are essential they should have as large a radius as possible. Bends on pipes of 65 mm or less should have a centre line radius of at least 75 mm.

1.2.13 Junctions on branch pipes should be made with a sweep of 25 mm minimum radius or at an angle 45°. Connection of branch pipes of 75 mm diameter or more to the stack should be made with a sweep of 50 mm minimum radius or at an angle 45°.

Ventilation of Branch Pipes

1.2.14 Where separate ventilation is not provided, the length and slope of the branch pipes should not exceed those shown in Diagram 3, in order to prevent the water seals in traps from being lost by pressures which can develop in the system.

1.2.15 If the values in Diagram 3 are exceeded, the branch pipe should be ventilated by a branch ventilating pipe to external air, to a discharge stack (modified single stack system) or to a ventilating stack (ventilated system).

1.2.16 A separate ventilating stack is only likely to be preferred where the number of ventilating pipes is large and the distance from a discharge stack is significant (see pars. 1.4.5 to 1.4.8).

Branch Ventilating Pipes

1.2.17 A branch ventilating pipe should be connected to the branch pipe within 300 mm of the trap and should not connect to the stack below the “spillover” level of the highest appliance served (see Diagram 4). The ventilation pipe should have a continuous incline from the branch pipe to the point of connection to the stack.

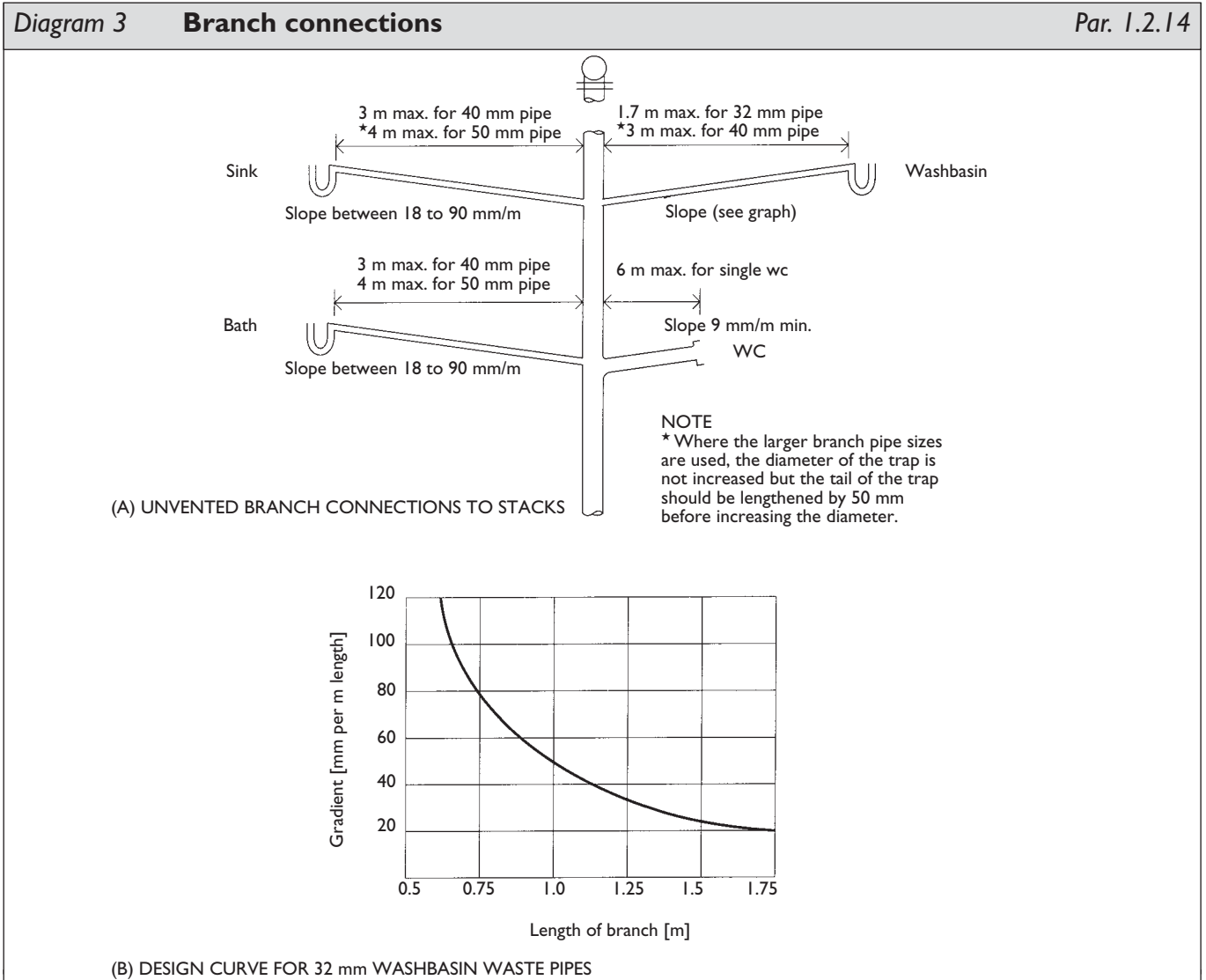
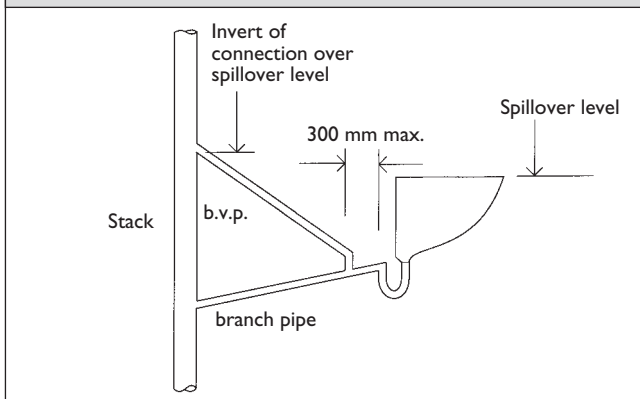


Table 3 Common branch pipes (unvented)

Appliance	Max Number to be connected	OR	Max length of branch (m)	Min size of pipe (mm)	Gradient limits (fall per metre)	
					min (mm)	max (mm)
wc's	8		15	100	9	to 90
urinals: bowls stalls	5		*	50	18	to 90
	6		*	65	18	to 90
washbasins	4		4 (no bends)	50	18	to 45

Note:
* No limitation as regards venting but should be as short as possible.

Diagram 4 Branch ventilation pipes Par. 1.2.17



1.2.18 Branch ventilation pipes which run direct to outside air should finish at least 900 mm above any opening into the building nearer than 3 m (see Diagram 5 and par. 1.2.25).

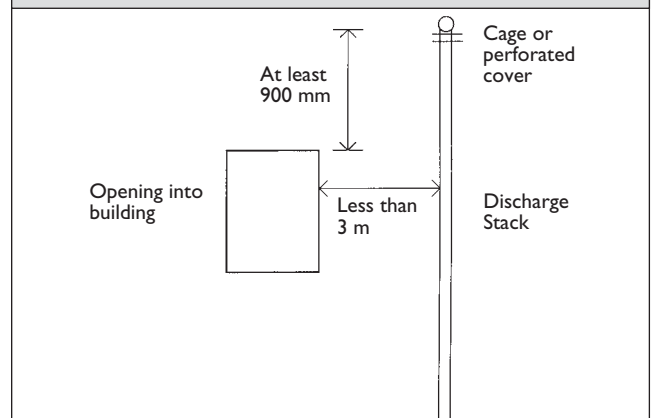
1.2.19 Branch ventilating pipes to branch pipes serving one appliance should be at least 25 mm diameter or, where the branch is longer than 15 m or has more than five bends, should be at least 32 mm.

1.2.20 Rodding points should be provided to give access to any lengths of branch pipes which cannot be reached by removing traps.

Discharge Stacks

1.2.21 All stacks should discharge to a drain. The bend at the foot of the stack should have as large a radius as possible and should be at least 200 mm at the centre line.

Diagram 5 Termination of ventilation stacks or ventilating part of discharge stacks Par. 1.2.18



1.2.22 Offsets in the 'wet' portion of a discharge stack should be avoided. If they are unavoidable then, in a building of not more than three storeys, there should be no branch connection within 750 mm of the offset. In a building of more than three storeys a ventilation stack may be needed with connections above and below the offset. In buildings over three storeys, discharge stacks should be located inside the building.

Sizes of Discharge Stacks

1.2.23 Stacks should have at least the diameter shown in Table 4 and should not reduce in the direction of flow. Stacks serving urinals should be not less than 50 mm in diameter and stacks serving water closets should be not less than 100 mm in diameter.

Table 4 Minimum diameters for discharge stacks

Stack size (mm)	Max capacity (litres/sec)
50 *	1.2
65 *	2.1
75 †	3.4
90	5.3
100	7.2

Note:

* No wcs

† See par. 1.3.11

Ventilation of Discharge Stacks

1.2.24 To prevent water seals in the traps from being lost by pressures which can develop in the system, stacks should be ventilated. Stacks connected to drains liable to surcharging or near an intercepting trap require ventilation pipes of not less than 50 mm diameter connected to the base of the stack above the likely flood level.

1.2.25 Ventilating pipes open to external air should finish at least 900 mm above any opening into the building within 3 m and should be finished with a cage or other perforated cover which does not restrict the flow of air (see Diagram 5).

Sizes of Stack Ventilation Pipes

1.2.26 The diameter of the part of a discharge stack which serves only for ventilation (the dry part above the highest branch) may be reduced in one and two storey houses, but should be at least 75 mm.

Access for Clearing Blockages

1.2.27 Rodding points should be provided to give access to any lengths of pipe which cannot be reached from any other part of the system. All pipes should be reasonably accessible for repair.

Materials for Pipes, Fittings and Joints

1.2.28 Any of the materials shown in Table 5 may be used. Different metals should be separated by non-metallic material to prevent electrolytic corrosion. Pipes should be firmly supported without restricting thermal movement. Attention is also drawn to the requirements of Part B of the Second

Table 5 Materials for sanitary pipework

Material	Irish/British Standards
Pipes	
cast iron	BS 416; BS 6087
copper	I.S. 238; BS 864; BS 2871
galvanised steel	BS 3868
PVC-u	BS 4514
polypropylene plastics	BS 5254
ABS	BS 5255; BS 5556
MUPVC	
polyethylene	I.S. 134; I.S. 135
polypropylene	
Traps	
copper	BS 1184
plastics	BS 3943

Note:

Some of these materials may not be suitable for conveying trade effluent.

Schedule to the Building Regulations, 1997, and guidance in Technical Guidance Document B relating to penetration of fire separating elements and of fire stopping provisions.

1.2.29 Airtightness - The pipes, fittings and joints should be capable of withstanding an air or smoke test of positive pressure of at least 38 mm water gauge for at least three minutes. During this time every trap should maintain a water seal of at least 25 mm. Smoke testing is not recommended for PVC-u pipes.

Sub-section 1.3 Foul Water Drainage - Pipework Underground

1.3.1 The provisions of this sub-section apply to foul water drainage. However, some public sewers may carry foul water and surface water in the same pipe. If the drainage system is to carry surface water to such a sewer, the following provisions still apply but the pipe sizes may need to be increased to carry the combined flows. Combined systems should not discharge to a septic tank.

1.3.2 Where gravity connection to the sewer is impracticable, sewage lifting equipment will be needed. Guidance on sewage lifting installations is contained in BS 8301 : 1985.

Layout

1.3.3 The layout of the drainage system should be as simple as possible. Changes of direction and gradient should be minimised and as easy as practicable. Access points should be provided only if blockages could not be cleared without them. Connections of drains to other drains or to sewers should be made obliquely, and in the direction of flow. They should be formed using a standard saddle connection.

1.3.4 The system should be ventilated by a flow of air. A ventilating pipe should be provided at or near the head of each main drain, to any branch longer than 6 m and on a drain fitted with an intercepting trap (particularly on a sealed system). Ventilated discharge stacks may be used (see pars. 1.2.24 and 1.2.25).

1.3.5 Pipes should be laid to even gradients and any change of gradient should be combined with an access point (see par. 1.3.21).

1.3.6 Pipes should be laid in straight lines where practicable but may be laid to slight curves if these can still be cleared of blockages. Any bends should be limited to positions in or close to inspection chambers or manholes (see par. 1.3.21) and to the foot of discharge and ventilating stacks. Bends should have as large a radius as practicable.

1.3.7 Special precautions should be taken to accommodate the effects of settlement where pipes run under or near a building, on piles or beams, in common trenches or in unstable ground. Precautions may also be necessary in situations involving surcharging of drains (see pars. 1.4.9 to 1.4.13).

Depth of Pipe Cover

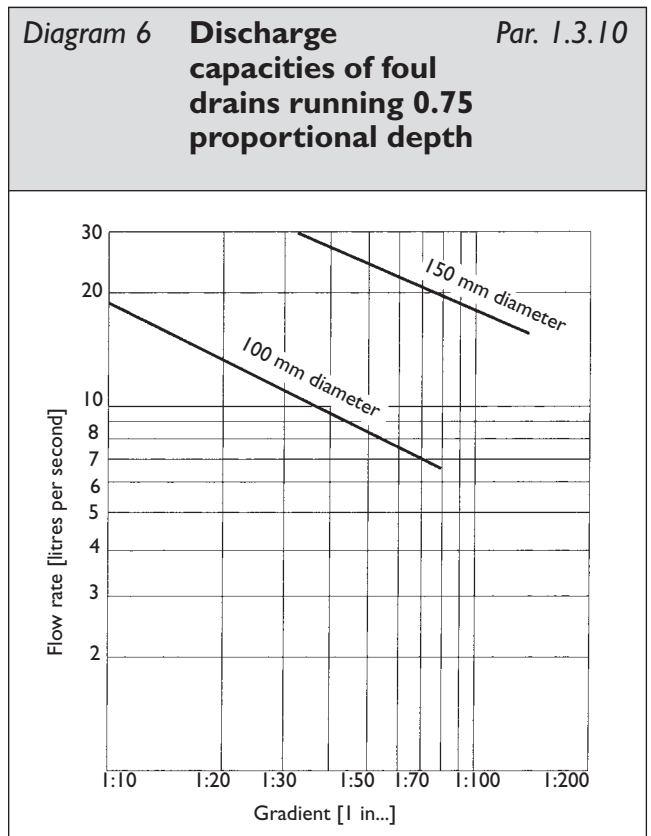
1.3.8 The depth of cover will depend on the levels of the connections to the system, the gradients at which the pipes are to be laid and the ground levels.

1.3.9 Pipes need to be protected from damage and if the proposed bedding class gives too little cover (or too much, when the pipes could be damaged by the weight of backfilling) for one combination of

cover, pipe strength and pipe bedding, it may be possible to choose another combination. Alternatively special protection can be provided (see pars. 1.4.14 to 1.4.16).

Pipe Gradients and Sizes

1.3.10 Drains should be laid to falls and have enough capacity to carry the flow. The flow depends on the appliances connected (see pars. 1.1.5 to 1.1.8 and Table 1) and the capacity depends on the size and gradient of the pipes (see Diagram 6).



1.3.11 Notwithstanding the discharge capacities shown in Diagram 6, a drain carrying foul water should have a diameter of at least 100 mm. The minimum size of a drain serving three or more dwellings should be 150 mm and no single drain should serve more than eight dwellings.

1.3.12 Table 6 shows the flattest gradients at which foul drains should be laid, (depending on the flow and the appliances connected to them) and the capacity they will then have (see also pars. 1.1.5 to 1.1.8).

Table 6 Recommended minimum gradients for foul drains

Peak flow (litres/sec)	Pipe size (mm)	Minimum gradient (1 in....)	Number of dwellings served
< 2.5	100	1:60 *	1
> 2.5	100	1:100 *	up to 3
	150	1:150†	3 to 8

Notes * Minimum of 1 wc
† Minimum of 5 wcs

1.3.13 Combined systems - The capacity of systems carrying foul water and surface water should take account of the combined peak flow (see par. 1.3.1).

Materials for Pipes and Jointing

1.3.14 Any of the materials shown in Table 7 may be used. Joints should be appropriate to the material of the pipes. To minimise the effects of any differential settlement, pipes should have flexible joints. All joints should remain watertight under working and test conditions and nothing in the pipes, joints or fittings should project into the pipe line or cause an obstruction. Different metals should be separated by non-metallic materials to prevent electrolytic corrosion.

Bedding and Backfilling

1.3.15 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.

1.3.16 Rigid pipes - The types of bedding and backfilling which should be used for rigid pipes of standard strength laid in a trench of any width are shown in Diagram 7 and Table 8. Minimum and maximum depths of cover are also shown for each type. For special protection where pipes are laid with less cover see par. 1.4.14.

Table 7 Materials for below ground gravity drainage

Material	Irish/British Standard
Rigid pipes	
fibre cement	I.S.EN 588-1
vitrified clay	I.S.EN 295; BS 65
concrete	I.S. 6; BS 5911 and for surface water drainage only, I.S. 166
grey iron	I.S. 262; BS 437
Flexible pipes	
PVC-u	I. S. 424; BS 4660; BS 5481; BS 5556

Note:
Some of these materials may not be suitable for conveying trade effluent.

1.3.17 Flexible pipes - Such pipes may become deformed under load and require support to limit the deformation to 5% of the diameter of the pipe. The bedding and backfilling should be as shown in Diagram 8. The minimum depth should be 900 mm under any road and 600 mm in fields and gardens. The maximum depth should be 10 m. For special protection where pipes are laid with less cover (see pars. 1.4.15 and 1.4.16).

Diagram 7 Bedding for rigid pipes

Par. 1.3.16

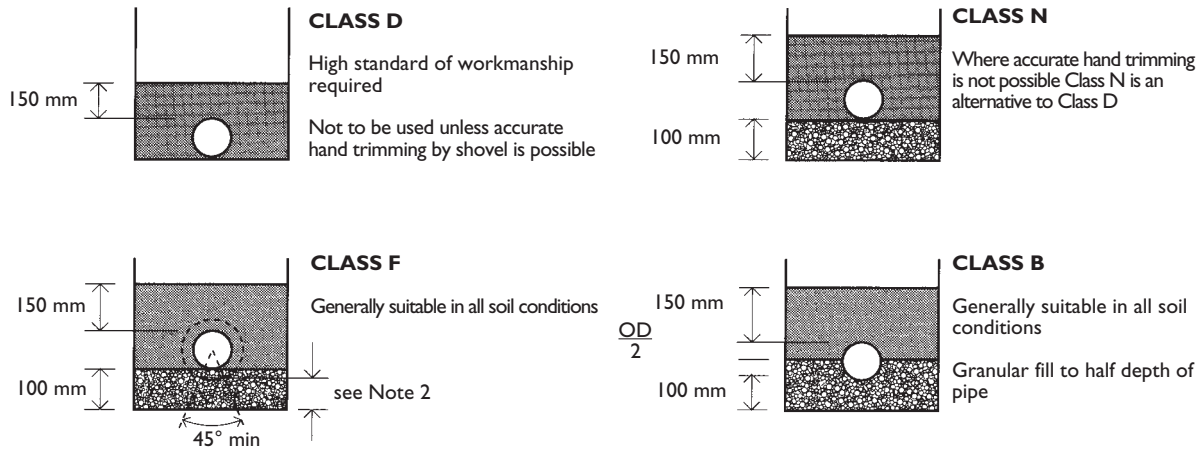
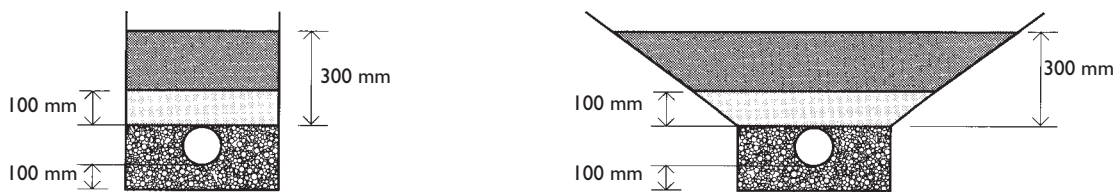


Diagram 8 Bedding for flexible pipes

Par. 1.3.17



KEY TO DIAGRAMS 7 AND 8



Selected fill: free from stones larger than 40 mm, lumps of clay over 100 mm, timber, frozen material, vegetable matter.



Selected fill or granular fill free from stones larger than 40 mm.



Should be 10mm aggregate conforming to I.S. 5: 1990 having a compaction fraction of 0.2 or less when tested in accordance with BS 8310: 1985 Appendix D.

NOTES

1. Provision may be required to prevent ground water flow in trenches with Class N, F or B type bedding.
2. Where there are sockets these should be not less than 50 mm above the floor of the trench.

Table 8 Limits of cover in metres for standard strength rigid pipes in any width of trench

Pipe bore (mm)	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

Note:
For limits of cover for flexible pipes see par. 1.3.17.

Clearance of Blockages

1.3.18 Sufficient and suitable access points should be provided for clearing blockages from drain runs by rodding which cannot be reached by any other means. The siting, spacing and type of the access points will depend on the layout, depth and size of the runs.

1.3.19 The provisions described below are for normal methods of rodding (which need not be in the direction of flow) and not for mechanical means of clearing.

1.3.20 Access points should be one of four types. Table 9 shows the depth at which each type should be used and the recommended dimensions. The dimensions should be increased at junctions if they do not allow enough space for branches. The types are:

- (a) rodding eyes - capped extensions of the pipes;
- (b) access fittings - small chambers on (or an extension of) the pipes but not with an open channel;
- (c) inspection chambers - shallow chambers e.g. an armstrong-junction, with working space at ground level;
- (d) manholes - large chambers with working space at drain level.

Siting of Access Points

1.3.21 - Access should be provided at the following points:

- (a) on or near the head of each drain run,
- (b) at a bend and at a change of gradient,
- (c) at a change of pipe size (but see below if it is at a junction), and
- (d) at a junction unless each run can be cleared from an access point (some junctions can only be rodded through from one direction).

1.3.22 Access should be provided to long runs. The distances between access points depend on the types of access used but should be not more than that shown in Table 10 for drains up to and including 300 mm.

Construction of Access Points

1.3.23 These should contain the foul water under working and test conditions and resist the entry of ground water and rainwater. Any of the materials shown in Table 11 may be used.

1.3.24 Where half round channels are used in inspection chambers and manholes, the branches should discharge into the channel at or above the level of the horizontal diameter. Where the angle of the branch is more than 45°, a three quarter section branch should be used. Channels and branches should be benched up at least to the top of the outgoing pipe and at a slope of 1 in 12. The benching should be rounded at the channel with a radius of at least 25 mm.

1.3.25 Inspection chambers and manholes should have removable non-ventilating covers of durable material (such as cast iron, cast or pressed steel, precast concrete or PVC-u) and be of suitable strength. Inspection chambers and manholes in buildings should have mechanically fixed airtight covers unless the drain itself has watertight access covers. Manholes deeper than 1 m should have metal step irons or fixed ladders.

Watertightness

1.3.26 After laying drains and combined drains, including any necessary concrete or other haunching or surrounding and backfilling, all pipes up to 300 mm diameter should be capable of withstanding a final water test to a pressure equal to 1.5 m head of water measured above the invert at the head of the drain, or an air test ensuring that head of water on a manometer does not fall by more than 25 mm in a period of five minutes for a 100 mm water gauge test pressure and 12 mm for a 50 mm water gauge test pressure.

Type	Depth to (m)	Internal Sizes		Cover Sizes	
		length x width (mm x mm)	circular (mm)	length x width (mm x mm)	circular (mm)
Rodding eye		As drain but min 100			
Access fitting small large	0.6 or less	150 x 100 300 x 100	150 -	150 x 100 300 x 100	150 -
Inspection chamber	0.6 or less 1.0 or less	300 x 300 450 x 450	190* 450	300 x 300 450 x 450	190* 450†
Manhole	1.5 or less over 1.5 over 2.7	1200 x 750 1200 x 750 1200 x 840	1000 1200 1200	600 x 600 600 x 600 600 x 600	600 600 600
Shaft	over 2.7	900 x 840	900	600 x 600	600

Notes: † For clayware or plastics may be reduced to 430 mm in order to provide support for cover and frame.
* Drains up to 150 mm

From	To	Access Fitting		Junction	Inspection chamber	Manhole
		Small	Large			
Start of external drain*		12	12	-	22	45
Rodding eye		22	22	22	45	45
Access fitting small 150 mm diam 150 x 100 mm large 300 x 100 mm		- -	- -	12 22	22 45	22 45
Inspection chamber		22	45	22	45	45
Manhole		22	45	45	45	90

Notes: * See par. 1.2.9

Material	Irish/British Standard
Inspection chambers and manholes	
- Bricks and blocks	I.S. 20; I.S. 91; I.S. 189
- Vitrified clay bricks	BS 65
- Concrete	
Precast	I.S. 6; I.S. 166; BS 5911
in situ	I.S. 325; I.S. 326
- Plastics	BS 7158; IAB Certificates
Rodding eyes and access fittings (excluding frames and covers)	as pipes, see Table 7.

1.3.27 Where the drain is water tested using a stand pipe of the same diameter as the drain, the section of the drain should be filled and left to stand for two hours and topped up. The leakage over thirty minutes should then be measured and should not be more than 0.05 litres for each metre run of drain for a 100 mm drain - a drop in water level of 6.4 mm/m, and not more than 0.08 litres for a 150 mm drain - a drop in water level of 4.5 mm/m.

1.3.28 To prevent damage to the drain, the head of water at the lower end of the section should not be more than 4 m and it may be necessary to test a drain in several sections.

Sub-section 1.4 Additional Guidance for Large buildings

Capacity of Pipes

1.4.1 Flow rates for other commonly used appliances not covered in Table 1 are shown in Table 12.

Appliance	Flow rate (litres per sec)
Spray tap basin	0.06
Washing machine	0.70

Traps

1.4.2 Minimum trap sizes and seal depths for appliances not listed in Table 2 are shown in Table 13.

Appliance	Diam of trap (mm)	Depth of seal (mm)
sanitary towel macerator	40	75
food waste disposal unit (industrial type)	50	75
urinal stall (1 to 6 person position)	65	50

Branch Pipes

1.4.3 A branch pipe should not discharge into a stack less than 750 mm above the invert of the tail of the bend at the foot of the stack in a building up to five storeys. Alternatively a branch pipe serving any ground floor appliance may discharge direct to a drain or into its own stack.

1.4.4 If the building has more than five storeys, ground floor appliances, unless discharging to a gully or drain, should discharge into their own stack.

Ventilating Stacks

1.4.5 A dry stack may provide ventilation for branch ventilating pipes as an alternative to carrying them to outside air or to a ventilated discharge stack (ventilated system).

1.4.6 Ventilation stacks serving buildings with not more than ten storeys and containing only dwellings should be at least 32 mm diameter.

1.4.7 The lower end of a stack may be connected directly to a bend (see par. 1.2.21) or it may be connected to a ventilated discharge stack in which case the connection should be below the lowest branch pipe.

1.4.8 The upper end of a stack may be carried to outside air (when it should finish as described in par. 1.2.18) or it may be connected to a ventilated discharge stack when the connection should be above the spill-over level of the highest appliance.

Special Protection - Settlement

1.4.9 A drain may run under a building if at least 100 mm of granular or other flexible filling is provided round the pipe. On sites where excessive subsidence is possible, additional flexible joints may be advisable or other solutions such as suspended drainage should be considered. Where the crown of the pipe is within 300 mm of the underside of a slab, concrete encasement should be used integral with the slab.

Concrete for pipe encasement should be composed of cement to I.S. 1: 1991 and fine and coarse aggregate conforming to I.S. 5: 1990 and should have a characteristic 28 day strength of 10 N/mm², cement content of 160 kg/m³ and a water/cement ratio of 0.85. Where volumetric mixing is required for small projects, a 1:10 cement aggregate mix may be used.

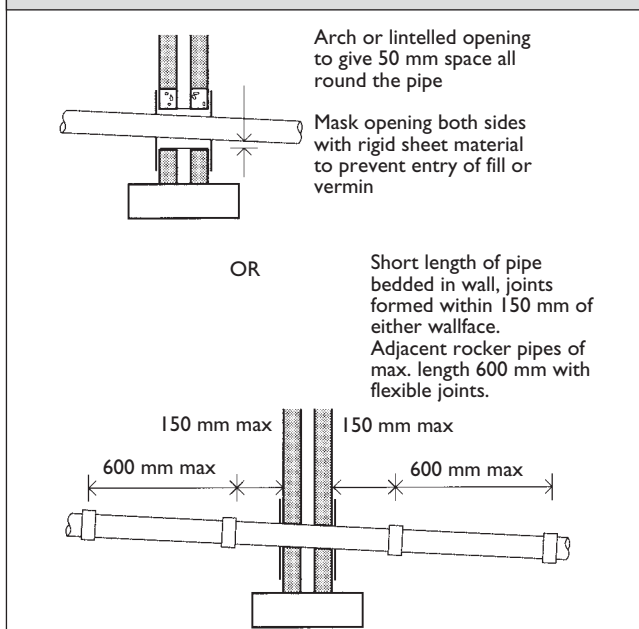
1.4.10 A drain may run through a wall or foundation. If it is necessary to build the pipe into the wall or foundation either-

- (a) an opening should be formed to give at least 50 mm clearance all round the pipe and the

opening masked with rigid sheet material to prevent the ingress of fill or vermin, or

- (b) a length of pipe (as short as possible) should be built in with its joints as close as possible to the wall faces (within at most 150 mm) and connected on each side to rocker pipes with a length of at most 600 mm and flexible joints (see Diagram 9).

Diagram 9 Pipes penetrating walls Par. 1.4.10

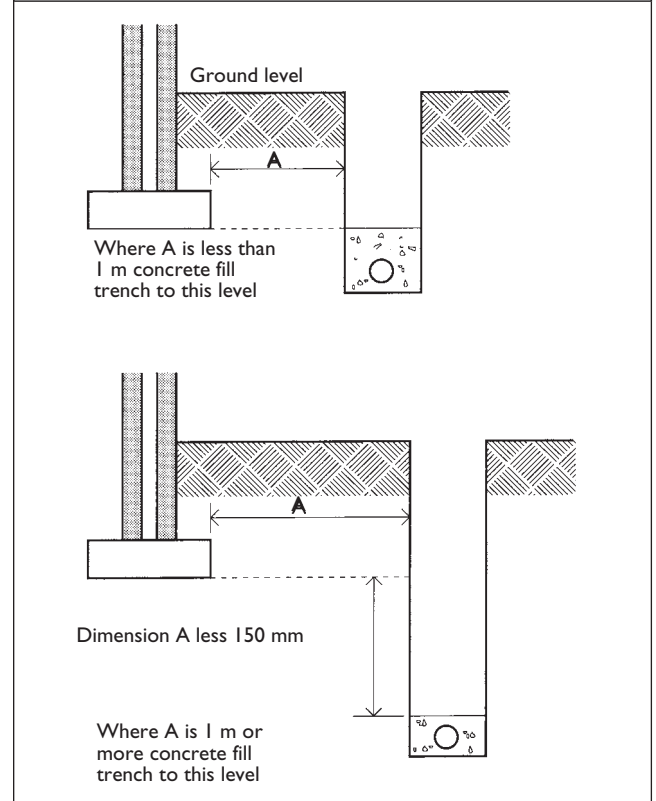


1.4.11 A drain trench should not be excavated lower than the foundations of any building nearby (see Diagram 10) unless either:

- (a) where the trench is within 1 m of the foundations of the building, the trench is filled with concrete up to the lowest level of the foundations, or
- (b) where the trench is further than 1 m from the foundation of the building, the trench is filled with concrete to a level below the lowest level of the foundation equal to the distance from the building, less 150 mm.

See par 1.4.9 for specification of concrete.

Diagram 10 Pipe runs near buildings Par. 1.4.11



1.4.12 Where pipes are to be laid on piles or beams or in a common trench, or where the ground may prove unstable, particularly where there is a high water table, the local authority may be able to provide information regarding the site.

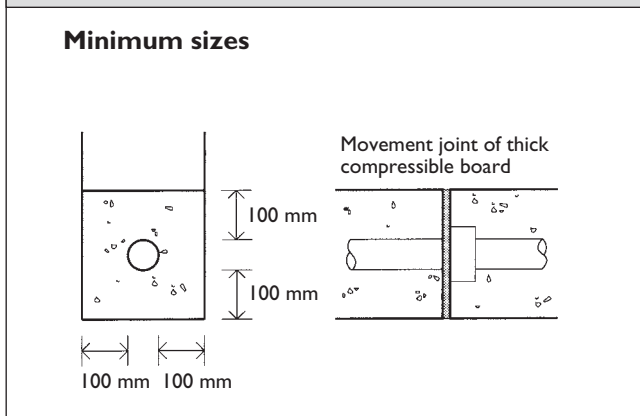
Special Protection - Surcharging of Drains

1.4.13 Where a drain is liable to surcharge, measures should be taken to protect the building. Protective measures are described in BS 8301.

Special Protection - Ground Loads

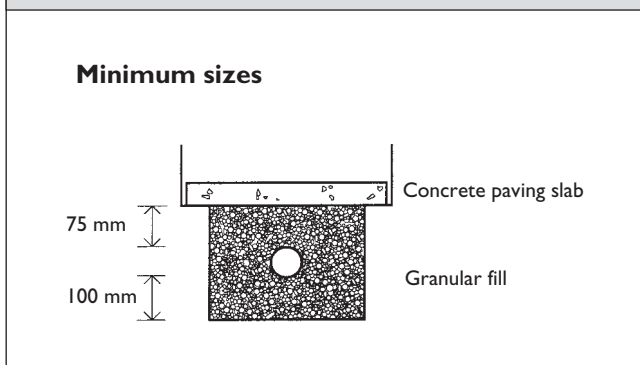
1.4.14 Where rigid pipes have less than the recommended cover in Table 8, the pipes should be protected by concrete encasement not less than 100 mm thick and having movement joints formed with compressible board at each socket or sleeve joint face (see Diagram 11).

Diagram 11 Concrete encasement for rigid pipes *Par. 1.4.14*



1.4.15 Where flexible pipes are not under a road and have less than 600 mm cover, they should have concrete paving slabs laid as bridging above the pipes with at least 75 mm of granular material between the top of the pipe and the underside of the slabs (see Diagram 12).

Diagram 12 Protection for flexible pipes *Par. 1.4.15*



1.4.16 Where flexible pipes are under a road and have less than 900 mm cover, reinforced concrete bridging or a reinforced concrete surround should be used instead of paving slabs. For specification of concrete see par. 1.4.9.

Sub-section 1.5 Surface Water Drainage

Gutters

There is no requirement in this Document for the provision of rainwater drainage for areas of 6 m² or less, i.e. small roofs, balconies etc., unless they receive a flow of rainwater from another pipe, roof or hard surface.

1.5.1 The flow into a gutter depends on the area of surface being drained and whether the surface is flat or pitched (and, if it is pitched, on the angle of pitch). Table 14 shows a way of allowing for the pitch by working out an effective area.

Table 14 Calculation of area drained

Type of surface	Effective design area (m ²)
1 flat roof	plan area of relevant portion
2 pitched roof at 30°	plan area of portion x 1.15
pitched roof at 45°	plan area of portion x 1.40
pitched roof at 60°	plan area of portion x 2.00
3 pitched roof over 70° or any wall	elevational area x 0.5

1.5.2 Table 15 shows the largest effective areas which should be drained into the gutter sizes which are most often used. These sizes are for a gutter which is laid level, half round in section with a sharp edged outlet at only one end and where the distance from a stop end to the outlet is not more than 50 times the water depth. At greater distances, the capacity of the gutter should be reduced. The Table shows the smallest size of outlet which should be used with the gutter.

1.5.3 Where the outlet is not at the end, the gutter should be of the size appropriate to the larger of the areas draining into it. Where there are two end outlets, they may be up to one hundred times the depth of flow, apart.

Table 15 Gutter sizes and outlet sizes

Max effective roof area (m ²)	Gutter size (mm dia)	Outlet size (mm dia)	Flow Capacity (litres/sec)
6.0	-	-	-
18.0	75	50	0.38
37.0	100	63	0.78
53.0	115	63	1.11
65.0	125	75	1.37
103.0	150	89	2.16

Note:

Refers to nominal half round eaves gutters laid level with outlets at one end sharp edged. Round edged outlets allow smaller downpipe sizes.

1.5.4 Gutters should be laid with any fall towards the nearest outlet. Where there is a fall, or the gutter has a section which gives it larger capacity than a half-round gutter, or the outlet is round edged, it may be possible to reduce the size of the gutter and pipe. BS 6367 : 1983 Code of practice for drainage of roofs and paved areas, contains detailed recommendations which makes reductions possible. Gutters should also be laid so that any overflow in excess of the design capacity caused by conditions such as above-normal rainfall will be discharged clear of the building.

Rainwater Pipes

1.5.5 Rainwater pipes should discharge into a drain or gully but may discharge to another gutter or onto another surface if it is drained. Any rainwater pipe which discharges into a combined system should do so through a trap (see sub-section 1.2).

1.5.6 The size of a rainwater pipe should be at least the size of the outlet from the gutter. A down pipe which serves more than one gutter should have an area at least as large as the combined areas of the outlets.

Materials for Gutters, Rainwater Pipes and Joints

1.5.7 The materials used should be of adequate strength and durability and,

- (a) all gutter joints should remain watertight under working conditions, and
- (b) pipes inside a building should be capable of withstanding the airtightness test described in par. 1.2.29, and
- (c) gutters and rainwater pipes should be firmly supported without restricting thermal movement, and
- (d) different metals should be separated by non-metallic material to prevent electrolytic corrosion.

1.5.8 Combined systems - Some public sewers carry foul water and surface water (combined systems) in the same pipe (see par. 1.3.1). All new drainage systems should be designed and constructed on the basis of a separate system even where draining into a combined system.

Design

The following provisions apply if the drainage system is to carry only surface water.

1.5.9 Where there is evidence of a liability to surcharging from sewers, or where levels in the building or on the site make gravity connection impracticable, surface water lifting equipment will be needed. Guidance on surface water lifting installations is contained in BS 8301.

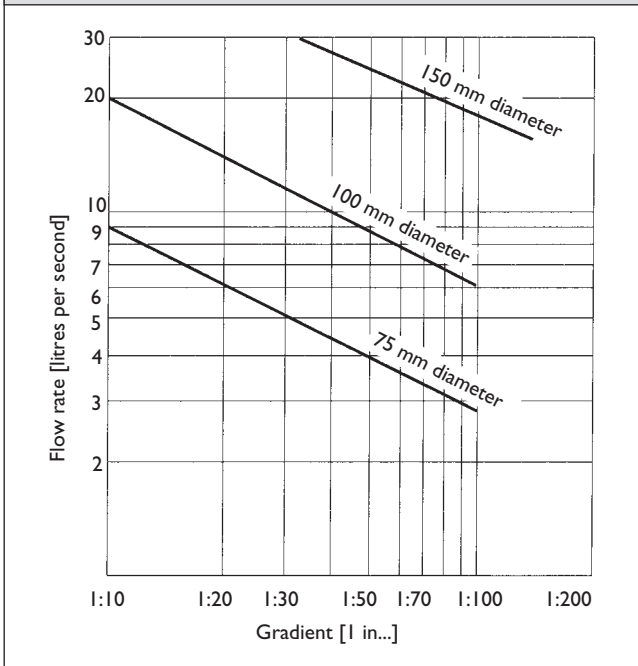
1.5.10 Layout - Refer to sub-section 1.3 - pars. 1.3.3 to 1.3.7.

1.5.11 Depth of pipes - Refer to sub-section 1.3 - pars. 1.3.8 and 1.3.9.

1.5.12 Pipe gradients and sizes - Drains should have enough capacity to carry the flow, which may include the run off from paved or other hard surfaces. A rainfall intensity of 50 mm per hour should be assumed for these areas (see par. 1.1.11). The capacity depends on the size and gradients of the pipes.

Drains should be at least 75 mm diameter. Diagram 13 shows the capacities of drains of various sizes at different gradients. 75 mm and 100 mm rainwater

Diagram 13 Discharge capacities of rainwater drains running full Par. 1.5.12



drains should be laid at not less than 1:100. However, the capacity can be increased by increasing the gradient, or by using larger pipes.

1.5.13 Materials for pipes and jointing - Refer to par. 1.3.14.

1.5.14 Bedding and backfilling - Refer to pars. 1.3.15 to 1.3.17.

1.5.15 Clearance of blockages - Refer to pars. 1.3.18 to 1.3.25.

1.5.16 Watertightness - Refer to pars 1.3.26 to 1.3.28.

Section 2

Septic Tanks

Septic tanks.	H2	A septic tank shall be - (a) of adequate capacity and so constructed that it is impermeable to liquids; (b) adequately ventilated; and (c) so sited and constructed that - (i) it is not prejudicial to the health of any person, (ii) it does not pollute, so as to endanger public health, any water (including ground water) which is used as a source of supply for human consumption, and (iii) there are adequate means of access for emptying.
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Guidance

2.1 Guidance on the design and installation of septic tank drainage systems for single houses is contained in S.R. 6 : 1991. This publication includes guidance relating to percolation areas, the distances between septic tanks and dwellings, wells, site boundaries and maintenance.

2.2 Guidance on the design and installation of septic tank drainage systems capable of serving more than one house is contained in BS 6297 : 1983.

2.3 There are other satisfactory waste water systems for treating domestic effluent which are not referred to in S.R. 6 1991. These systems are based on biological action such as filtration or activated sludge. Each should be considered on its merits. It is essential that they be operated in accordance with manufacturers' instructions, including the necessary regular maintenance.

Standards and other references

- I.S. 5 : 1990 Parts 1 to 3.19 Aggregates for Concrete
- I.S. 6 : 1974 Concrete Sewer Pipes
- I.S. 20 : Part 1 : 1987 Concrete Building Blocks, Part 1, Normal Density Blocks
- I.S. 91 : 1983 Clay Building Bricks
- I.S. 134 : 1977 Polyethylene Pipe Type 32
- I.S. 135 : 1975 Polyethylene Pipe Type 50
- I.S. 166 : 1972 Concrete Surface Water Pipes
- I.S. 189 : 1974 Concrete Building Bricks
- I.S. 238 : 1980 Copper Tubes
- I.S. 239 : 1987 Compression Tube Fittings of Copper and Copper Alloy for Water and Sanitation Purposes
- I.S. 262 : 1984 Grey Iron and Ductile Iron Pipe Fittings
- I.S. 325 : Part 1 : 1986 Use of Masonry : Part 1 Structural Use of Unreinforced Masonry Amd No.1 : 1988; AMD No.2 1992
- I.S. 326 : 1988 Code of Practice for the Structural Use of Concrete
- I.S. 424 : 1990 Unplasticized Polyvinylchloride (PVC-U) Pipes and Fittings for Buried Drainage and Sewage Systems - Specification
- S.R. 6 : 1991 Septic Tank Systems - Recommendations for Domestic Effluent Treatment and Disposal from a Single Dwelling House
- I.S./EN 124 : 1994 Gully Tops and Manhole Tops for Vehicular and Pedestrian Areas - Design Requirements. Type, Testing Marking and Quality Control
- I.S./EN 295-1 : 1992 Vitrified clay pipes and fittings and pipe joints for drains and sewers Part 1 : Requirements
- I.S./EN 295-2 : 1992 Vitrified clay pipes and fittings and pipe joints for drains and sewers Part 2 : Quality control and sampling
- I.S./EN 295-3 : 1992 Vitrified clay pipes and fittings and pipe joints for drains and sewers Part 3 : Test methods
- I.S. EN 588-1: 1997. Fibre-cement pipes for sewers and drains - Part 1: Pipes, joints and fittings for gravity systems.
- BS 65 : 1991 Specification for vitrified clay pipes, fittings and ducts, also flexible mechanical joints for use solely with surface water pipes and fittings
- BS 416 Discharge and ventilating pipes and fittings, sandcast or spun in cast iron Part 1 : 1990 Specification for spigot and socket systems
- BS 416 Discharge and ventilating pipes and fittings, sandcast or spun in cast iron Part 2 : 1990 Specification for socketless systems
- BS 437 : 1978 Specification for cast iron spigot and socket drain pipes and fittings AMD 5877
- BS 864 Capillary and compression tube fittings of copper and copper alloy Part 2 : 1983 Specification for capillary and compression fittings for copper tubes AMD 5097; AMD 5651; AMD 7067
- BS 864 Capillary and compression tube fittings of copper and copper alloy Part 5 : 1990 Specification for compression fittings for polyethylene pipes with outside diameters to BS 5556
- BS 1184 : 1976 (1981) (Obsolescent) Specification. Copper and copper alloy traps
- BS 2871 Specification for copper and copper alloys. Tubes Part 1 : 1971 Copper tubes for water, gas and sanitation AMD 1422; AMD 2203
- BS 3868 : 1995 Specification for prefabricated drainage stack units : galvanized steel
- BS 3943 : 1979 (1988) Specification for plastics waste traps AMD 3206; AMD 4191; AMD 4692
- BS 4514 : 1983 Specification for unplasticized PVC soil and ventilating pipes, fittings and accessories AMD 4517; AMD 5584
-

BS 4576 Unplasticized polyvinylchloride (PVC-U) rainwater goods and accessories Part 1 : 1989 Half round gutters and pipes of circular cross-section AMD 6350

BS 4660 : 1989 Specification for unplasticized polyvinyl chloride (PVC-U) pipes and plastics fittings of nominal sizes 110 and 160 for below ground drainage and sewerage

BS 5254 : 1976 Specification for polypropylene waste pipe and fittings (external diameter 34.6 mm, 41.0 mm and 54.1 mm) AMD 3588; AMD 4438

BS 5255: 1989 Specification for thermoplastics waste pipe and fittings

BS 5481 : 1977 (1989) Specification for unplasticized PVC pipe and fittings for gravity sewers AMD 3631; AMD 4436

BS 5556 : 1976 (1986) Specification for general requirements for dimension and pressure ratings for pipe of thermoplastics materials

BS 5572 : 1994 Code of practice for sanitary pipework

BS 5911 Precast concrete pipes, fittings and ancillary products Part 2 : 1982 Specification for inspection chambers AMD 5146; AMD 8077

BS 5911 Precast concrete pipes, fittings and ancillary products Part 100 : 1988 Specification for unreinforced and reinforced pipes and fittings with flexible joints AMD 6269; AMD 7588

BS 5911 Precast concrete pipes, fittings and ancillary products Part 101 : 1988 Specification for glass composite concrete (GCC) pipes and fittings with flexible joints

BS 5911 Precast concrete pipes, fittings and ancillary products Part 110 : 1982 Specification for ogee pipes and fittings (including perforated) AMD 8155

BS 5911 Precast concrete pipes, fittings and ancillary products Part 114 : 1992 Specification for porous pipes

BS 5911 Precast concrete pipes, fittings and ancillary products Part 120 : 1989 Specification for reinforced jacking pipes with flexible joints

BS 5911 Precast concrete pipes, fittings and ancillary products Part 200 : 1989 Specification for unreinforced and reinforced manholes and soakaways of circular cross section

BS 5911 Precast concrete pipes, fittings and ancillary products Part 230 : 1994 Specification for road gullies and gully cover slabs

BS 6087 : 1990 Specification for flexible joints for grey or ductile cast iron drain pipes and fittings (BS 437) and for discharge and ventilating pipes and fittings (BS 416) AMD 6357

BS 6297 : 1983 Code of practice for design and installation of small sewage treatment works and cesspools AMD 6150

BS 6367 : 1983 Code of practice for drainage of roofs and paved areas AMD 4444

BS 7158 : 1989 Specification for plastics inspection chambers for drains

BS 8301 : 1985 Code of practice for building drainage AMD 5904; AMD 6580

BS EN 295 : Vitrified clay pipes and fittings and pipe joints for drains and sewers BS EN 295-6 : 1996 Requirements for vitrified clay manholes

Local Government (Sanitary Services) Act 1948 (No 3 of 1948)

Local Government (Sanitary Services) Acts 1878-1964

Council Directive 80/68/EEC of 17 December, 1979, on the protection of groundwater against pollution caused by certain dangerous substances