Department of
Finance and
Personnel
www.dfpni.gov.uk

Building Regulations (Northern Ireland) 2012

Guidance

Technical Booklet N

Drainage

October 2012

Contents

Online version

Introduction

Technical Booklets

This Technical Booklet, which takes effect on 31st October 2012, is one of a series that has been prepared by the Department of Finance and Personnel (the Department) for the purpose of providing practical guidance with respect to the technical requirements of the Building Regulations (Northern Ireland) 2012 (the Building Regulations).

At the back of each Technical Booklet is a list of all the Technical Booklets that have been prepared and published by the Department for this purpose.

The guidance given in a Technical Booklet includes performance standards and design provisions relating to compliance with specific aspects of the Building Regulations for the more common building situations.

If the guidance in a Technical Booklet is followed there will be a presumption of compliance with the requirements of those Building Regulations covered by that guidance. However, this presumption can be overturned, so simply following the guidance does not guarantee compliance. For example, if a particular circumstance is not one of the more common building situations the design provisions given in the Technical Booklet may not be appropriate.

There are likely to be alternative ways of demonstrating compliance with the relevant requirements of the Building Regulations other than by following a design provision given in a Technical Booklet. There is therefore no obligation to adopt any particular provision set out in a Technical Booklet, should you decide to comply in some other way. However, you will have to demonstrate that your alternative solution meets the relevant requirements of the Building Regulations by those other means.

This Technical Booklet

Requirements

The guidance contained in this Technical Booklet relates only to the requirements of regulations 80, 81 and 82. The work will also have to comply with all other relevant requirements of the Building Regulations.

Materials and workmanship

Any building work which is subject to requirements imposed by Part A of the Building Regulations should be carried out in accordance with regulation 23 of those regulations. Guidance on meeting these requirements for materials and workmanship is given in Technical Booklet B which supports Part B.

The Building Regulations are made for specific purposes, primarily securing the health, safety, welfare and convenience of people and for the conservation of fuel and power. Standards and technical approvals are relevant guidance to the extent that they relate to these purposes. However, they may also address other aspects of performance such as serviceability, or aspects which although they relate to health and safety are not covered by the Building Regulations.

Named standards

Where this Technical Booklet makes reference to a named standard, the relevant version of the standard is the one listed in the Appendix. However, if this version has been replaced or updated by the issuing standards body, the new version may be used as a source of guidance provided that it continues to address the relevant requirements of the Building Regulations.

Diagrams

The diagrams in this Technical Booklet supplement the text. They do not show all the details of construction and are not intended to illustrate compliance with any other requirement of the Building Regulations. They are not necessarily to scale and should not be used as working details.

Protected buildings

District councils have a duty to take account of the desirability to preserve the character of protected buildings when carrying out their functions under Building Regulations. Therefore, where work is to be carried out to a protected building to comply with Part N or any other Part of the Building Regulations, special consideration may be given to the extent of such work for compliance where it would unacceptably alter the character or appearance of the building. Protected buildings are defined in Article 3A(2) of the Building Regulations (Northern Ireland) Order 1979 (as amended).

Other legislation

The provisions of this Technical Booklet relate to the requirements of Building Regulations and do not include measures which may be necessary to meet the requirements of other legislation. Such other legislation may operate during the design or construction stages or when a building is brought into use and can extend to cover aspects which are outside the scope of the Building Regulations.

Relevant statutory requirements can be found in the *Construction (Health, Safety and Welfare) Regulations 1996, the Construction (Design and Management) Regulations 1994* and the *Confined Spaces Regulations 1997*.

The Health and Safety Executive operates an Information Line and produces the following advisory codes and information leaflets related to earthworks, drainage and working in confined spaces which are available from HSE Books.

Health and Safety in Excavation – be safe and shore, Booklet HSG 185.

Safe Work in Confined Spaces – Approved Code of Practice, Regulations and Guidance, Booklet L101.

The Workplace (Health, Safety and Welfare) Regulations (Northern Ireland) 1993

The Workplace (Health, Safety and Welfare) Regulations (Northern Ireland) 1993 (the Workplace Regulations) contain some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see – The Workplace Regulations and the Workplace Health, Safety and Welfare Approved Code of Practice.

The Workplace Regulations apply to the common parts of flats and similar buildings if people such as cleaners, wardens and caretakers are employed to work in these common parts. Where the requirements of the Building Regulations that are covered by Part N do not apply to dwellings, the provisions may still be required in the situations described above in order to satisfy the Workplace Regulations.

Part N Regulations

Part N (comprising regulations 78 – 83) of the Building Regulations which sets out the requirements for the provision of drainage to buildings, has been replicated below for the convenience of the user of this Technical Booklet and is taken directly from the Building Regulations (Northern Ireland) 2012.

Any person who intends to demonstrate compliance with the Building Regulations by following the guidance given in this Technical Booklet is advised to ensure that the regulations below are current on the date when plans are deposited or notices given to the district council.

As Part A (comprising regulations 1 – 21) of the Building Regulations sets out the interpretation along with the procedural requirements relating to the application of the regulations, the Department advises that all Parts of the Building Regulations be read in conjunction with Part A of those regulations.

The Building Regulations (Northern Ireland) 2012 and any subsequent amendment may be viewed by following the links from the Department's website at "www.buildingregulationsni.gov.uk".

PART N

Drainage

Application and interpretation

78.—(1) Regulation 82 shall not apply to a drainage system intended for use in connection with a roof or balcony of 6 m^2 or less in area, unless that roof or balcony receives a flow of rainwater from another part of a building.

(2) In this Part—

"Foul water" means waste from a sanitary appliance and water which has been used for cooking or washing purposes and not contaminated by trade effluent;

"Rainwater drainage" includes gutters, pipes, drains and fittings which convey rainwater only;

"Sanitary appliance" has the meaning assigned to it by regulation 84 in Part P;

"Sanitary pipework" means a pipe or system of pipes for conveying foul water from a fitting to an underground foul drain; and

"Underground foul drainage" includes drains and private sewers used in connection with buildings but not a system which is solely for the conveyance of subsurface water.

Drainage systems

79. Every building shall be provided with such sanitary pipework, underground foul drainage and rainwater drainage as may be necessary for the hygienic and adequate disposal of foul water and rainwater from that building.

Sanitary pipework

80. Sanitary pipework shall—

(a) consist of pipes and fittings—

(i) of such size, layout, construction and watertightness; and

(ii) with sufficient ventilation,

to ensure the hygienic conveyance of foul water to an underground foul drainage system; and

(b) have such means of access as is necessary to facilitate the clearance of blockages.

Underground foul drainage

81. Underground foul drainage shall—

(a) consist of pipes and fittings—

(i) of such size, layout, construction and watertightness; and

(ii) with sufficient ventilation,

to ensure the hygienic conveyance of foul water to a sewer, cesspool, septic tank or similar structure; and

(b) have such means of access as is necessary to facilitate the clearance of blockages.

Rainwater drainage

82. Rainwater drainage shall—

(a) consist of pipes and fittings—

(i) of such size, layout, construction and watertightness; and

(ii) with sufficient ventilation,

to ensure the hygienic conveyance of rainwater to a surface water or combined sewer, a soakaway or a watercourse; and

(b) have such means of access as is necessary to facilitate the clearance of blockages.

Cesspools, septic tanks and similar structures

83.—(1) Any cesspool, septic tank or similar structure shall be—

(a) so constructed as to be impervious to both liquid from the inside and subsoil water from the outside; and

(b) so sited—

(i) as not to render liable to pollution any spring, stream, well, adit or other source of water which is used, or is likely to be used, for drinking, domestic or kitchen purposes;

(ii) that there is ready means of access for cleansing it and removing its contents without carrying them through any building in which any person resides or is employed in any manufacture, trade or business, or to which the public has access; and

(iii) as not to be in such proximity to any building in which any person resides or is employed in any manufacture, trade or business, or to which the public has access, as to be liable to become a source of nuisance or a danger to health.

(2) A cesspool shall be—

(a) of suitable depth to enable it to be emptied completely;

(b) properly covered so as to be impervious to surface water and rainwater;

(c) fitted with a suitable manhole cover for the purposes of inspection (including inspection of the inlet), emptying and cleansing;

(d) adequately ventilated;

(e) without any outlet for overflow or discharge other than the outlet provided for emptying or cleansing; and

(f) of a capacity, measured below the level of the inlet, of not less than 18 m^3.

(3) Any structure to which paragraph (1) applies other than a cesspool shall be—

(a) of suitable depth;

(b) of adequate size, having in no case a capacity of less than 2.7 m^3;

(c) covered or fenced in;

(d) if covered, adequately ventilated and constructed with means of access for the purposes of inspection (including inspection of the inlet and outlet), emptying and cleansing; and

(e) fitted with filter or other treatment facility for effluent (including subsurface irrigation) or both, sited to comply with the requirements of paragraph (1)(b)(i) and (iii).

Guidance - Performance and introduction to provisions

PERFORMANCE STANDARDS

Sanitary pipework and underground foul drainage

Performance

0.1 It is the view of the Department that the requirements of regulations 80 and 81 will be met if a foul water drainage system –

(a) conveys the flow of foul water to a foul water outfall connected to a foul or combined sewer, a cesspool, septic tank or similar structure;

(b) minimises the risk of blockage or leakage;

(c) prevents foul air from the system from entering the building under working conditions;

(d) is ventilated; and

(e) is accessible for clearing blockages.

Introduction to provisions in Sections 2 and 3

0.2 The guidance in Section 2 covers various aspects of sanitary pipework design including suitable materials, pipe sizing, capacity of pipes, seals and ventilation. Guidance is also given on drainage for condensate from condensing boilers.

The guidance in Section 3 gives the provisions which if followed would meet the regulations for underground foul drainage including suitable materials, protection and cover of pipes, access and ventilation of drainage systems.

Rainwater drainage

Performance

0.3 It is the view of the Department that the requirements of regulation 82 will be met if –

(a) rainwater from a building is carried away from the surface by a drainage system; and

(b) a rainwater drainage system –

(i) carries the flow of rainwater from the building to an outfall connected to a soakaway, a water course or a combined sewer;

(ii) minimises the risk of blockage or leakage; and

(iii) is accessible for clearing blockages.

Introduction to provisions in Section 4

0.4 Section 4 gives guidance on the design of rainwater drainage including suitable materials, the sizing of pipes, gutters and outlets, and the capacity of the system related to the expected flow and the area to be drained.

Section 1 General

Definitions

1.1 Refer to the Part N Regulations, Application and interpretation, for the definitions which apply in this Technical Booklet.

General

1.2 The provisions in this Technical Booklet are applicable primarily to domestic buildings and small non-domestic buildings. For larger or more complex systems seek specialist advice.

1.3 The guidance in this Technical Booklet is applicable for WCs with major flush volumes. Consideration should be given to the increased risk of blockages when using WCs with low flush volumes.

Safe working in drains and sewers

1.4 Laying and maintaining drains are hazardous operations. Appropriate safety codes should be followed including procedures for working in confined spaces. Safe working procedures and permits may be required in some situations.

Section 2 Sanitary pipework

Materials for pipes, fittings and joints

2.1 The materials for sanitary pipework should be in accordance with the relevant standard given in Table 2.1. Where different metals are used they should be separated by non-metallic material to prevent electrolytic corrosion. Pipes should be firmly supported without restricting thermal movement.

Table 2.1 Materials for sanitary pipework

Material	Relevant standard
Pipes:	
Cast iron	BS 416, BS EN 877
Copper	BS EN 1254 BS EN 1057
Galvanised steel	BS 3868
uPVC	BS 4514, BS EN 1329
Polypropylene	BS EN 1451
Other plastic	BS EN 1329, BS EN 1451, BS EN 1455, BS EN 1519, BS 4514
Traps:	
Plastic	BS EN 274

Capacity of pipes

2.2 The capacity of a sanitary pipework system should be adequate to carry the expected flow at any point, provided that where a minimum size of pipe is stated in a paragraph, Table or Diagram that size of pipe should be provided. The expected flow depends on the type, number and grouping of appliances and the flow rates given in Table 2.2 should be assumed.

Table 2.2 Flow rates from appliances

Appliance	Flow rate (litres/sec)
WC (9 litre cistern)	2.30
Washbasin	0.60
Spray tap basin	0.06
Sink	0.90
Bath	1.10
Shower	0.10
Automatic washing machine	0.70
Urinal (per person unit)	0.15

Water seals (traps)

2.3 All points of discharge into a system should be fitted with a water seal (trap) to prevent air from the system entering the building. The minimum size of trap and depth of seal for an appliance should be as given in Table 2.3.

Table 2.3 Minimum trap sizes and seal depths

Appliances	Diameter of trap (mm)	Depth of seal (mm)
Washbasin Bidet	32	75(1)
Sink Bath Shower Food waste disposal unit Urinal bowl	40	75(1)
WC	75	50
Sanitary towel macerator	40	75
Food waste disposal unit (industrial type)	50	75
Urinal (1-6 persons units)	65	50

Note:

(1) May be reduced to 40 mm for a washbasin, sink, bath or shower located on the ground floor and discharging into an external gully.

Watertightness

2.4 The system should be capable of withstanding an air or smoke test of a positive pressure of 38 mm on a water gauge for at least 3 minutes, and every trap should maintain a water seal of at least 25 mm.

Access for cleaning blockages in traps

2.5 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.

Ventilation

2.6 To prevent the water seal from being broken by the pressures which may develop in the system a branch pipe should either be ventilated as described in paragraph 2.11 or constructed as described in paragraph 2.12.

Overflow pipes

2.7 Where an overflow pipe discharges to a branch pipe or a stack it should do so through a trap. In all other cases an overflow pipe should discharge in a visible location and should not cause dampness in, or damage to, any part of a building.

Branch pipes

2.8 A branch pipe should be at least the same diameter as the appliance trap and where it serves more than one appliance and is unvented, it should be of at least the diameter and gradient given in Table 2.4. A bend in a branch pipe should have as large a radius as possible and never be less than 75 mm centre line radius. A junction on a branch pipe should be made either at 45º or with a minimum sweep of 25 mm radius. The connection of a branch pipe of 75 mm or more in diameter to a stack should be made either at 45º or with a minimum sweep of 50 mm radius.

A branch pipe should discharge into a stack –

(a) in a way which prevents cross-flow into another branch pipe (see Diagram 2.1); and

(b) not less than the relevant height, above the invert level at the foot of the stack, given in Diagram 2.1.

2.9 The branch pipe from an appliance on a storey above the ground storey should discharge into another branch pipe or a discharge stack. An appliance on the ground storey may discharge into another branch pipe or a discharge stack, a stub stack, a drain or (if the appliance is for washing purposes only) a gully provided that –

(a) a branch pipe from a water closet discharges directly to a drain only if the drop is less than 1.5 m (see Diagram 2.2); and

(b) a branch pipe discharges to a gully only between the grating and the top level of the water seal.

Table 2.4 Common branch discharge 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)
WCs	8		15	100	9(2)	to	90
Urinals:							
Bowls	5		–(1)	50	18	to	90
Stalls	6		–(1)	65	18	to	90
Washbasins	4		4 (no bends)	50	18	to	45

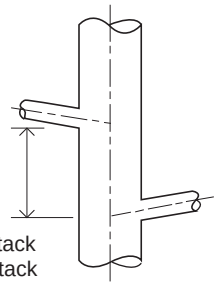
Notes:

(1) No limitations as regards venting but should be as short as possible.

(2) Minimum gradient should be not less than 18 mm if only 1 WC is connected.

Diagram 2.1 Branch connections to stacks

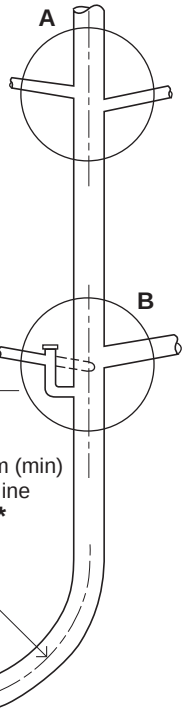
see para 2.8(a) and (b)

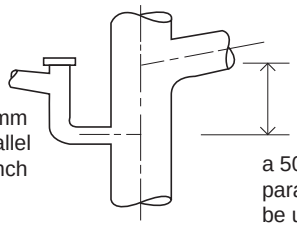


smaller similar sized opposed branches not directly opposite should be offset by:
110 mm on 100 mm diameter stack
250 mm on 150 mm diameter stack

Detail at A

a branch creates a no connection zone on a stack.
no other branch may be fitted so that it's centre line falls inside a zone but its centre line may be on the boundary of the zone.

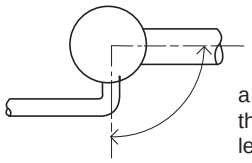




Detail at B

a 50 mm diameter parallel branch should be used where a branch pipe would enter the stack within 200 mm below a WC connection

Height of building	H
houses up to 3 storeys	450 mm
any building up to 5 storeys	750 mm
any building up to 20 storeys	1 storey
any building over 20 storeys	2 storeys



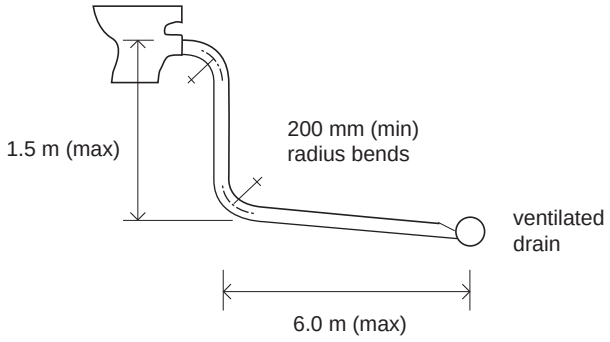
Alternate detail at B

a branch pipe may enter the stack at the same level as a WC connection if the connections are at right angles

* radius may be reduced to 200 mm for houses up to 3 storeys

Diagram 2.2 Direct connections of ground floor WC to a drain

see para 2.9(a)



Access for clearing blockages in branch pipes

2.10 Rodding points should be provided to give access to any length of branch pipe which cannot be reached by removing a trap.

Branch ventilating pipes

2.11 Subject to paragraph 2.12 a branch ventilating pipe should be connected to a branch pipe within 300 mm of the trap (see Diagram 2.4) and should be not less than 25 mm diameter or, where the length of the ventilating pipe exceeds 15 m or has more than 5 bends, not less than 32 mm diameter. A branch ventilating pipe should –

(a) terminate in the external air at least 900 mm above any opening into a building within 3 m, with a cage or cover which does not restrict the air flow (see Diagram 2.3);

(b) connect to a ventilated discharge stack above the “spillover” level of the highest appliance served (see Diagram 2.4); or

(c) connect to a ventilating stack (see paragraph 2.13).

Diagram 2.3 Termination of ventilating pipes and stacks

see para 2.11(a), 2.13(a), 2.15(a) and 3.5(a)

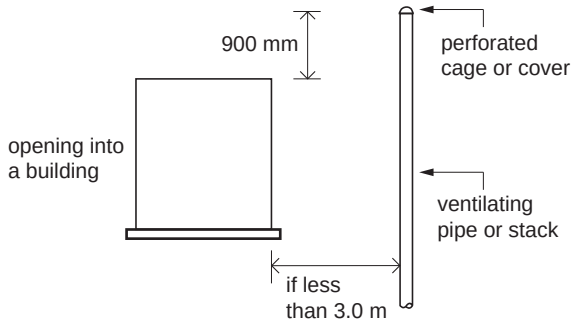
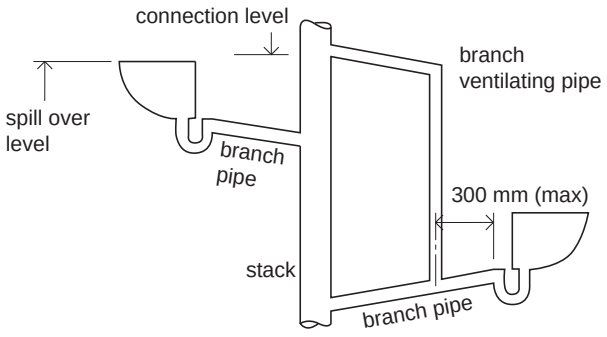


Diagram 2.4 Branch ventilation pipes

see para 2.11(b)

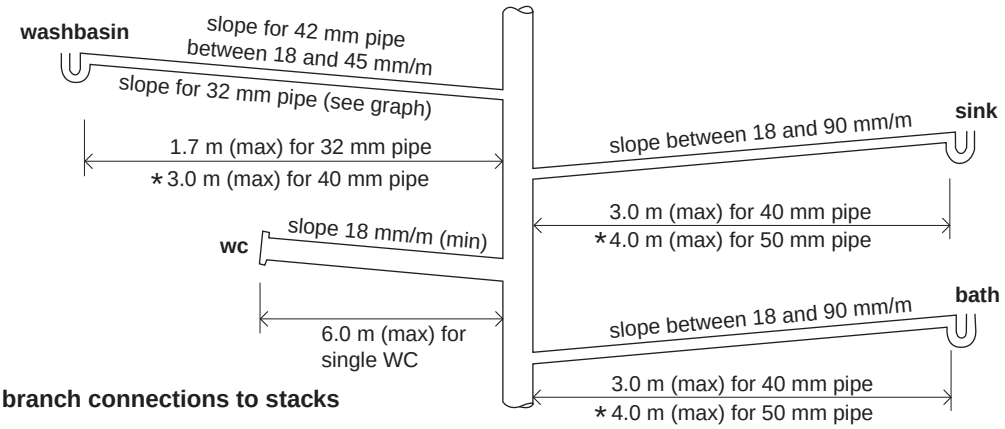


Unventilated branch pipes

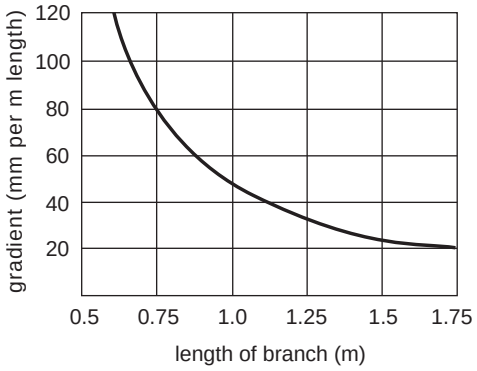
2.12 A branch ventilating pipe should not be required if the length and slope of a branch pipe does not exceed the maximum dimensions and gradients for the relevant pipe diameters given in Diagram 2.5.

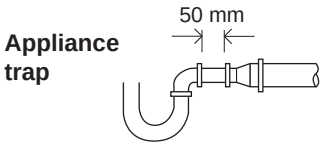
Diagram 2.5 Branch connections

see para 2.12



(a) Unvented branch connections to stacks





* Where the larger branch pipe size is used and the diameter of the trap is not increased the tail of the trap should be lengthened by 50 mm before increasing the diameter

(b) Design curve for 32 mm washbasin wastes

Ventilation stacks

2.13 A ventilation stack should provide ventilation to branch ventilation pipes and may also provide ventilation to underground foul drainage (see paragraph 3.5). The lower end of a ventilation stack may be connected to a ventilated discharge stack below the lowest branch pipe connection. The upper end of a ventilation stack should –

(a) terminate in the external air at least 900 mm above any opening into a building within 3 m, with a cage or cover which does not restrict the air flow (see Diagram 2.3);

(b) terminate with an air admittance valve which complies with BS EN 12056: Part 2 and BS EN 12380; or

(c) connect to a ventilated discharge stack above the “spillover” level of the highest appliance served.

Discharge stacks

2.14 A stack should discharge into a drain and be of at least the internal diameter given in Table 2.5. The diameter of a stack should not reduce in the direction of flow, nor have an offset in any part carrying foul water. The bend at its foot should have a centre line radius as large as possible but not less than 200 mm. A discharge stack in a building over 3 storeys should be located internally.

Table 2.5 Minimum diameter for discharge stacks

Peak flow rate (litres/sec)	Min diameter (mm)
1.2	50(1)
2.1	65(1)
3.4(2)	75
5.3	90
7.2	100

Notes:
(1) No WCs.
(2) Not more than 1 siphonic WC permitted.

Ventilation of discharge stacks

2.15 A discharge stack (other than a stub stack complying with paragraph 2.16) should be ventilated. The diameter of the part of a stack above the highest branch pipe may be reduced to 75 mm where the stack is of a greater diameter.

The upper end of a stack should terminate either –

(a) in the external air at least 900 mm above any opening into a building within 3 m, with a cage or cover which does not restrict the air flow (see Diagram 2.3); or

(b) with an air admittance valve which complies with BS EN 12056: Part 2 and BS EN 12380.

Unvented stub stacks

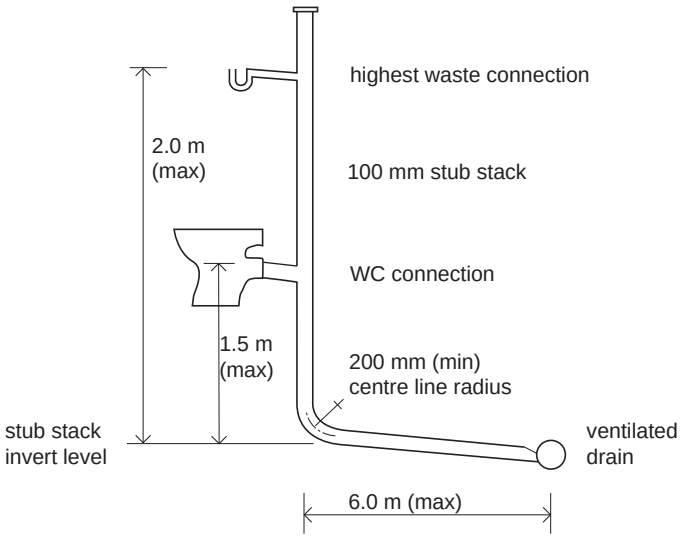
2.16 A stub stack may be unvented if it connects to a ventilated discharge stack or drain and is not more than 6 m from the discharge stack or drain. No branch pipe should discharge into a stub stack at a height above the invert at the foot of the stack more than –

(a) 1.5 m where it is from a WC; or

(b) 2 m where it is from another appliance (see Diagram 2.6).

Diagram 2.6 Stub stacks

see para 2.16(b)



Access for clearing blockages in stacks

2.17 Rodding points should be provided to give access to a length of stack or discharge stacks which cannot be reached from another part of the system.

Drainage for condensate from condensing boilers

2.18 Condensate from condensing boilers should be taken to a suitable drain. This condensate drain may be connected to sanitary pipework. The connection should be made with pipework having a minimum diameter of 22 mm and should incorporate a 75 mm condensate trap. Where the condensate trap is provided externally to the boiler, an air gap should be provided between the boiler and the trap with the condensate drain discharging into a suitable tundish upstream of the trap.

The connection should preferably be made to an internal drainage stack.

Where the connection is made to a branch pipe it should be connected downstream of any sink waste connection.

All sanitary pipework into which condensate is to discharge, should be made of materials resistant to a pH value of 6.5 or lower and the installation should be in accordance with BS 6798.

Where it is not practicable to follow the above provisions, alternative provision for the drainage of condensate from a condensing boiler is given in Appendix C of the "*Guide to the Condensing Boiler Installation Assessment Procedure for Dwellings*".

Section 3 Underground foul drainage

Materials for pipes, fittings and joints

3.1 The materials for drains should be in accordance with the relevant standards given in Table 3.1. Where different metals are used they should be separated by non-metallic material to prevent electrolytic corrosion. Rigid pipes should have flexible joints. All joints should remain watertight under working conditions. Nothing in the pipes, joints or fittings should project into the pipe line or cause an obstruction.

Table 3.1 Material for underground foul drainage

Material	Relevant standard
Rigid pipes:	
Fibre cement	BS EN 588
Vitrified clay	BS 65, BS EN 295
Concrete	BS 5911, BS EN 1916, BS EN 1917,
Grey iron	BS 437
Flexible pipes:	
uPVC	BS 4660, BS EN 13598, BS EN 1401

Layout of drainage system

3.2 The system should have as few changes of direction and gradient as practicable, and access points (see paragraph 3.12) should be provided at such changes. Drains should be laid to an even gradient and in straight lines between access points (slightly curved drains may be acceptable in certain circumstances). Other than at the foot of the discharge stack (see paragraph 2.14) bends should have as large a radius as practicable and be in or adjoining inspection chambers or manholes. Where a drain runs under or near a building special precautions to accommodate the effects of settlement should be taken (see paragraph 3.9 and 3.10).

Northern Ireland Water (NIW) controls the connection of a drain to a sewer, therefore any connection should be installed according to the adoptive standards in the NIW publication *Sewers for adoption Northern Ireland - A design and construction guide for developers in Northern Ireland*.

Capacity of pipes

3.3 The capacity of a system should be adequate to carry the expected peak flow at any point provided that the pipe diameter is not less than 100 mm where the drain carries water from a WC and 75 mm in all other cases. Table 3.2 gives the minimum gradient at which a pipe should be laid for a given peak flow. Diagram 3.1 gives the capacities which should be assumed for various diameters of drain laid at various gradients.

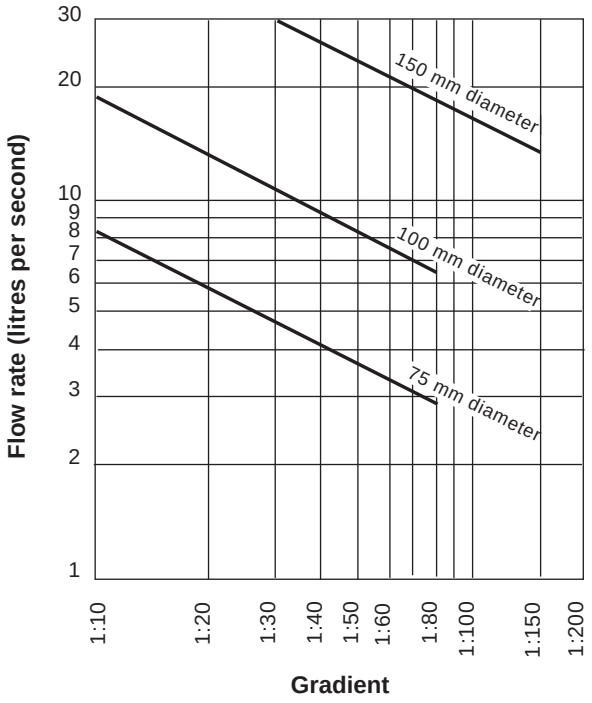
Table 3.2 Minimum gradients

Peak flow (litres/sec)	**Pipe size** (mm)	**Minimum gradient**
less than 1	75 100	1 : 40 1 : 40
greater than 1	75 100 150	1 : 80 1 : 80(1) 1 : 150(2)

Notes:
(1) Minimum of 1 WC.
(2) Minimum of 5 WCs.

Diagram 3.1 Discharge capacities of drains running at 0.75 proportional depth

see para 3.3



Combined systems

3.4 The capacity of a system carrying both foul water and rainwater should be adequate for the combined peak flow.

Ventilation

3.5 The system should be ventilated at or near the head of a main drain, and a branch drain longer than 10 m. A ventilation stack (see paragraph 2.13) or, a ventilated discharge stack (see paragraph 2.15) or a separate ventilation pipe should be used. Where a separate ventilation pipe is used it should terminate either –

(a) in the external air at least 900 mm above any opening into a building within 3 m, with a cage or cover which does not restrict the air flow (see Diagram 2.3); or

(b) with an air admittance valve which complies with BS EN 12056: Part 2 and BS EN 12380.

Depth of pipe cover

3.6 A drain should be laid either at a depth which will protect it from damage or with special protection over it (see paragraph 3.8). The maximum and minimum depths of cover for standard strength rigid pipes given in Table 3.3 should be used in conjunction with the classes of bedding given in Diagram 3.2. The depth of cover for flexible pipes used in conjunction with the bedding given in Diagram 3.3 should be –

(a) a minimum of 600 mm under a vehicle area and 300 mm under other areas; and

(b) a maximum of 10 m under all areas.

The side cover for all types of pipe should be 150 mm or the diameter of the pipe, whichever is the greater.

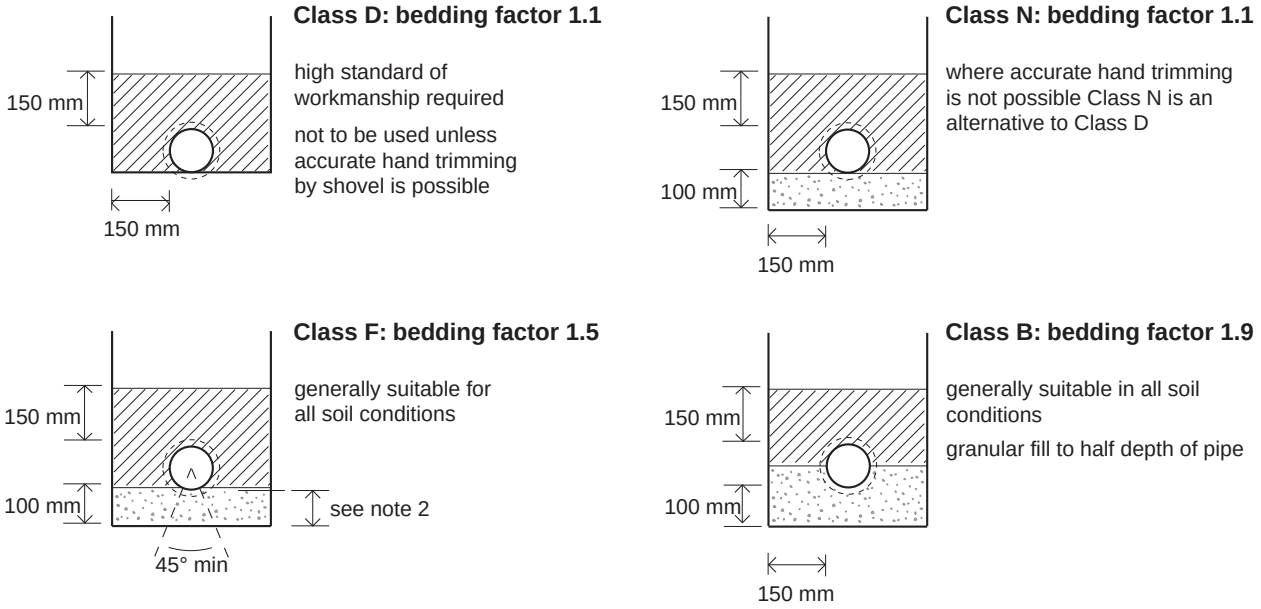
The depth of cover will normally depend on the levels of the connections to the drain, the gradient and the ground levels. If the depth is too little then imposed loads, agricultural activities, etc., or frost could cause damage. If the depth is too great then the weight of the backfilling could cause damage. A change of pipe material, bedding or backfilling may obviate the need for special protection against ground loads, and guidance is given in BS EN 752 and BS 8301.

Table 3.3 Limits of cover for standard strength rigid pipes in any width of trench

Pipe diameter	Bedding class	Fields and gardens		Light traffic roads		Heavy traffic roads	
(mm)		Min (m)	Max (m)	Min (m)	Max (m)	Min (m)	Max (m)
100 or less	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

Diagram 3.2 Bedding for rigid pipes

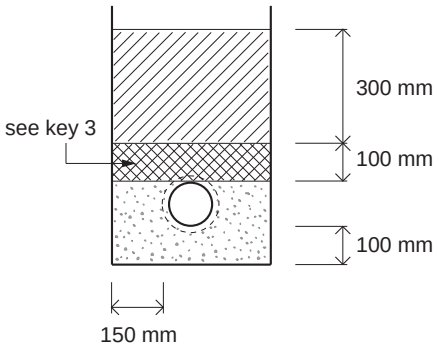
see para 3.6



See key and notes to Diagrams 3.2 and 3.3

Diagram 3.3 Bedding for flexible pipes

see para 3.6



See key and notes to Diagrams 3.2 and 3.3

Key and notes to diagrams 3.2 and 3.3

Key:

1. Selected fill; free from stones larger than 40 mm, lumps of clay over 100 mm, timber, frozen material and vegetable matter.
2. Granular material - for rigid pipes the granular material should conform to BS EN 1610 Annex B Table B15 and should be single size material or graded material from 5 mm up to a maximum size of 10 mm for 100 mm pipes, 14 mm for 150 mm pipes, 20 mm for pipes from 150 mm up to 600 mm diameter and 40 mm for pipes more than 600 mm diameter. Compaction fraction maximum 0.3 for class N or B and 0.15 for class F.
3. Selected fill or granular fill free from stones larger than 40 mm.

Notes:

1. Provision may be required to prevent ground water flow in open trenches with Class N, F or B bedding.
2. Where the pipe has sockets and Class D bedding is used, holes which should be as short as is practicable, should be prepared in the trench bottom to give a clearance of 50 mm beneath the socket.
3. Where the pipe has sockets and Class F or N bedding is used the sockets should be not less than 50 mm above the floor of the trench.

Backfilling

3.7 Backfilling should not displace the drain from its line and level and should be compacted in layers. Mechanical compaction equipment should not be used until there is a minimum of 450 mm compacted material above the top of the drain.

Special protection – ground loads

3.8 Where a rigid pipe of –

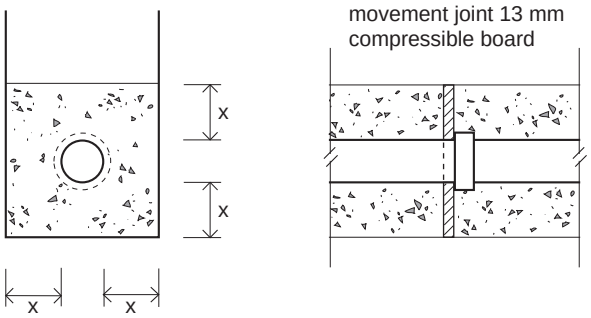
(a) less than 150 mm diameter has less than 300 mm depth of cover; or

(b) 150 mm or more diameter has less than 600 mm depth of cover,

it should be surrounded with concrete either 100 mm or the diameter of the pipe, whichever is the greater, in thickness and have movement joints, at not more than 5 m centres (see Diagram 3.4).

Diagram 3.4 Concrete encasement for rigid pipes

see para 3.8

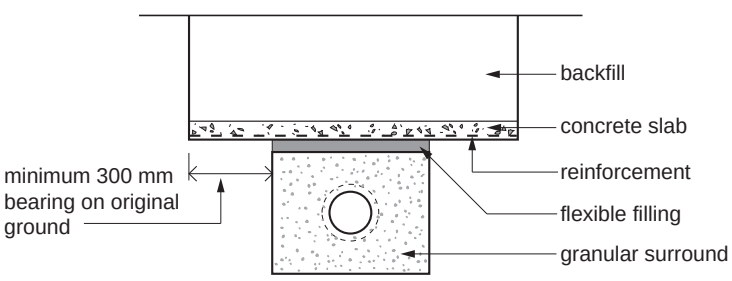


x = diameter of pipe or 100 mm whichever is greater

Where a flexible pipe has less than 300 mm depth of cover under an area other than a vehicular area, it should have concrete paving slabs laid as bridging on granular or other flexible filling at least 75 mm above the top of the pipe. Where a flexible pipe has less than 600 mm depth of cover under a vehicular area it should have a reinforced concrete slab laid as bridging in a similar manner (see Diagram 3.5).

Diagram 3.5 Protection for flexible pipes

see para 3.8



Special protection – settlement

3.9 A drain which runs under a building should be surrounded by at least 100 mm of granular or other flexible filling.

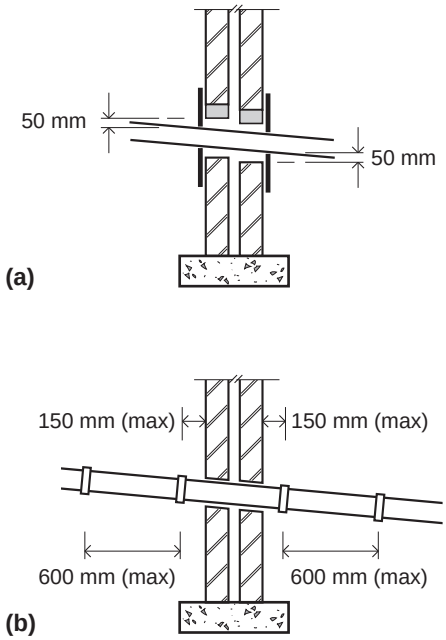
A drain which passes through a wall or foundation should either –

(a) pass through an opening giving at least 50 mm clearance all round as shown in Diagram 3.6(a); or

(b) be built in with, on each side, flexible joints within 150 mm and rocker pipes of maximum length 600 mm as shown in Diagram 3.6(b).

Diagram 3.6 Pipes penetrating walls

see para 3.9



arched or lintelled opening to give at least 50 mm space all round the pipe

mask openings both sides of wall with rigid sheet material to prevent entry of fill or vermin and fill void with compressive sealant to prevent entry of gas

short length of pipe bedded in wall with joints formed within 150 mm of either wall face

adjacent rocker pipes of 600 mm (max) length with flexible joints

3.10 A drain which is at a level lower than the foundations of a building should either –

(a) where the trench is within 1 m of the foundations, be filled with concrete up to the level of the underside of the foundations as shown in Diagram 3.7(a); or

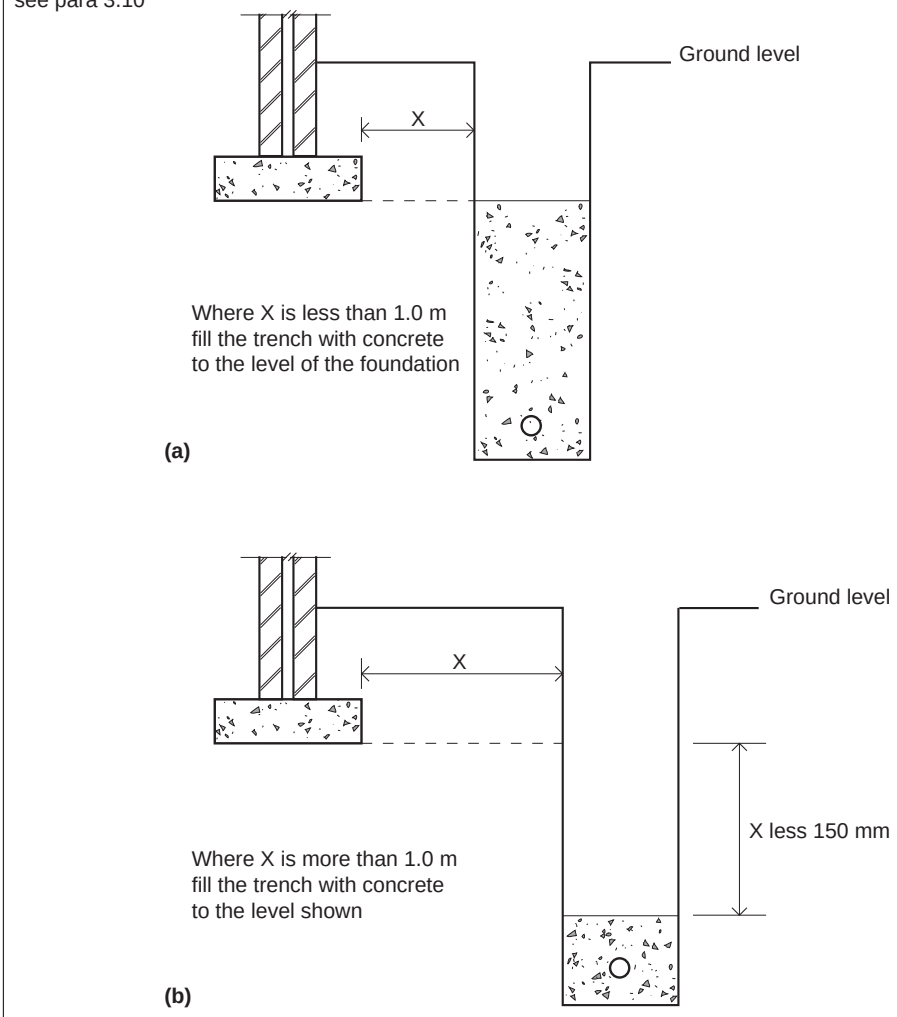
(b) where the trench is more than 1 m from the foundations, be filled with concrete to a level, below the level of the underside of the foundations, equal to the distance from the foundations less 150 mm as shown in Diagram 3.7(b).

Flexible pipes should be wrapped in polythene before surrounding in concrete. The minimum thickness of the concrete surround should be 150 mm or the diameter of the pipe whichever is the greater.

Where a drain is to pass under a foundation, be supported on piles, or where the ground is unstable, specialist advice should be sought on the protective measures needed.

Diagram 3.7 Pipe runs near building

see para 3.10



Special protection – surcharging

3.11 Where a drain is liable to surcharge, protective measures as described in BS EN 752 and BS 8301 should be used.

Access for clearing blockages

3.12 Access should be provided for clearing a blockage in any length of drain, though access need not necessarily be provided for rodding in the direction of flow.

An access point should comply with the limiting depth and dimensions given in Table 3.4. The types of access are –

(a) rodding eye – a capped extension of the pipe;

(b) access fitting – a small chamber on (or on an extension of) a drain but not with an open channel;

(c) inspection chamber – a chamber with an open channel but not with working space at drain level; and

(d) manhole – a chamber with an open channel and working space at drain level.

Table 3.4 Minimum dimensions for access fittings and chambers

		Internal sizes		Cover sizes	
Type	**Depth to invert** (m)	**Length x width** (mm x mm)	**Circular** (mm)	**Length x width** (mm x mm)	**Circular** (mm)
Rodding eye	–	As drain but minimum 100	–	–	–
Access fitting: small large	0.6 or less	150 x 100 225 x 100	150 –	150 x 100 225 x 100	150 –
Inspection chamber	0.6 or less 1.0 or less	– 450 x 450	190(1) 450	– 450 x 450	190(1) 450(2)
Manhole	1.5 or less over 1.5	1200 x 750 1200 x 750	1050 1200	600 x 600 600 x 600	600 600
	Manholes over 2.7 m deep should have a chamber 2 m deep accessed by a shaft 900 x 840 mm or 900 mm in diameter.				

Notes:

(1) Drains up to 50 mm.

(2) For clayware or plastic chambers the clear width may be reduced to 430 mm to provide support for cover and frame.

Siting of access points

3.13 An access point should be provided at the following –

(a) at or near the head of each length of drain;

(b) at a bend;

(c) at a change of gradient;

(d) at a change of pipe size;

(e) at a junction;

(f) on long lengths of drain at not greater than the distance given in Table 3.5; and

(g) within 12 m of the connection to a sewer unless access is provided at the connection.

Table 3.5 Maximum spacing of access points (m)

From / To	Access fitting		Inspection Chamber	Manhole
	Small	Large		
Start of drain(1)	12	12	22	45
Rodding eye	22	22	45	45
Access fitting:				
Small	–	–	22	22
Large	–	–	45	45
Inspection chamber	22	45	45	45
Manhole	22	45	45	90

Note:
(1) Connection from ground floor appliances or stacks.

Construction of access points

3.14 An access point should contain the foul water under working conditions, restrict the entry of ground water and rainwater, and be constructed of a material given in Table 3.6.

An inspection chamber or manhole should have a half round channel with any branch drain discharging into the channel at or above the level of its horizontal diameter and at not more than 90º to the direction of flow. Where the angle of a branch drain is more than 45º a three-quarter section branch should be used. The channel and any branches should be benched up, at least to the top of the outgoing drain, at a slope of 1 in 12 and the benching should be rounded with a radius of at least 25 mm.

Every external access point should have a removable non-ventilating cover of durable material and suitable strength.

Every access point within a building should have a mechanically fixed airtight cover unless the drain itself has a watertight access cover.

Any manhole deeper than 1.0 m should have metal step irons or a fixed ladder.

Table 3.6 Materials for access points

Material	British Standard
Inspection chambers and manholes:	
Clay bricks and blocks	BS EN 771
Vitrified clay	BS 65, BS EN 295
Precast concrete	BS 5911, BS EN 1916, BS EN 1917
In-situ concrete	BS 8110, BS EN 1992
Rodding eyes and access fittings (excluding frames and covers)	As pipes (see Table 3.1)

Watertightness

3.15 A drain of diameter less than 300 mm should be capable of withstanding a test either –

(a) by water to a pressure equal to 1.5 m head of water measured above the invert at the top of the drain; or

(b) by air to a maximum loss of head on a manometer, in a period of 5 minutes, of 25 mm for a 100 mm gauge, or 12 mm for a 50 mm gauge.

A drain which is to be water tested should be divided into sections so that the head of water at the lower end of the section should not exceed 4 m.

The section of drain should be filled, left standing for 2 hours, topped up and the leakage measured after a further 30 minutes. The leakage during the 30 minute test period should not exceed 0.5 litres per meter diameter of pipe per metre run.

For example –

(a) for a 100 mm drain – 0.05 litres per metre run of drain (a drop of 6.4 mm per metre run); or

(b) for a 150 mm drain – 0.08 litres per metre run of drain (a drop of 4.5 mm per metre run).

For further information and for larger sizes see BS 8000: Part 14 or BS EN 1610.

Section 4 Rainwater drainage

Materials for gutters, rainwater pipes and joints

4.1 The materials for gutters and rainwater pipes should be in accordance with the relevant standards given in Table 4.1.

Where different metals are used they should be separated by non-metallic material to prevent electrolytic corrosion. Gutters and rainwater pipes should be firmly supported without restricting thermal movement.

Table 4.1 Materials for gutters and rainwater pipes

Material	Relevant standard
Aluminium	BS 2997, CP 143
Cast Iron	BS 416, BS EN 877 BS 460
Copper	BS EN 612
Galvanised steel	BS 5493, BS EN ISO 12944 BS EN ISO 14713
Lead	BS EN 12588
Low carbon steel	BS 5493, BS EN ISO 12944 BS EN ISO 14713
Pressed steel	BS 1091
uPVC	BS 4514, BS EN 1329 BS EN 12200, BS EN 1462, BS EN 607
Zinc	BS EN 612

Capacity of the system

4.2 The capacity of the system should be adequate to carry the expected flow at any point and an intensity of rainfall of 75 mm per hour should be assumed.

Area to be drained

4.3 The area to be drained should be calculated using the factors given in Table 4.2.

Table 4.2 Calculation of area drained

Surface	Design area (m^2)
1. Roofs:	
0º up to 10º	Plan area of relevant portion
11º up to 30º	Plan area of portion x 1.15
31º up to 45º	Plan area of portion x 1.40
46º up to 70º	Plan area of portion x 2.00
over 70º	Elevation area x 0.5
2. Walls:	Elevation area x 0.5

Gutters and outlets

4.4 A gutter should be laid with a slight fall towards the outlet. Where the outlet is not at the end, the gutter should be sized for the larger of the areas draining into it. The gutter should be laid or constructed so that any overflow will discharge clear of the building.

The flow capacity of a gutter is dependent upon its cross sectional area, length, bends (if any) and the shape of the outlet.

Table 4.3 gives the maximum effective areas which can be drained into the common sizes of true half round eaves gutters with sharp edged outlets. The Table also gives the minimum sizes of outlets which should be used with the gutters and the flow capacities for use with paragraph 4.6.

Table 4.3 Gutter and outlet sizes for true half round eaves gutters

Max effective roof area (m^2)	**Gutter size** (mm diameter)	**Outlet size** (mm diameter)	**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

Rainwater pipes

4.5 A rainwater pipe should discharge to a drain, a gully, a gutter, or to another surface if it is drained. A rainwater pipe which discharges to a combined sewer should do so through a trap. The size of a rainwater pipe should be at least that of the outlet from the gutter. Where a rainwater pipe serves more than one gutter it should have an area at least as large as the combined areas of the outlets.

Rainwater drains

4.6 The capacity which should be assumed for rainwater drainage pipes laid at various gradients is given in Diagram 4.1 and the minimum diameter of such pipes should be 75 mm.

Materials for pipes, fittings and joints should be as paragraphs 3.1 or 4.1.

The layout of the system should be as paragraph 3.2.

Combined systems should be as paragraph 3.4.

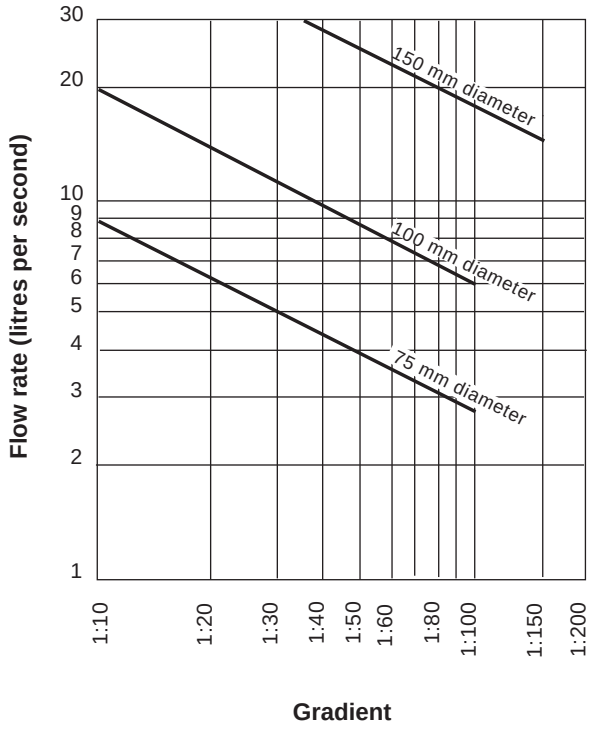
Backfilling should be as paragraph 3.7.

Special protection, if required should be as paragraphs 3.8, 3.9, 3.10 and 3.11.

Access for clearing blockages should be as paragraphs 3.12 and 3.13.

Diagram 4.1 Discharge capacites of rainwater drains running full

see para 4.6



Watertightness

4.7 Gutter joints should remain watertight under working conditions. A rainwater pipe inside a building should be capable of withstanding the test described in paragraph 2.4. A rainwater drain (other than a soakaway) should be capable of withstanding either of the tests described in paragraph 3.15.

Appendix Publications referred to

British Standards

BS EN ISO 12944: Parts 1 to 8 Paints and varnish. Corrosion protection of steel structures by protective paint systems.

BS EN ISO 14713: 1999 Zinc coatings. Guidance and recommendations for the protection against corrosion of iron and steel in structures.

BS EN 274: 2002 Waste fittings for sanitary appliances.

BS EN 295: 1991 Vitrified clay pipes, fittings and pipe joints for drains and sewers:

Part 1: 1991 Test requirements. Incorporating Amendments:
AMD 9290 December 1996,
AMD 9429 May 1997
AMD 10621 December 1999

Part 2: 1991 Quality control and sampling. Incorporating Amendment:
AMD 10620 December 1999

Part 3: 1991 Test methods. Incorporating Amendment:
AMD 10357 February 1999

Part 5: 1994 Requirements for perforated vitrified clay pipes and fittings.

BS EN 588-1: 1997 Fibre-cement pipes for sewers and drains. Pipes, joints and fittings for gravity systems.

BS EN 607: 2004 Eaves gutters and fittings made of PVC-U. Definitions, requirements and testing.

BS EN 612: 2005 Eaves gutters with bead stiffened fronts and rainwater pipes with seamed joints made of metal sheet. Incorporating Amendment:

AMD 16137 as Corrigendum No 1 January 2006.

BS EN 752: 2008 Drain and sewer systems outside buildings.

BS EN 771-1: 2003 Specification for masonry units. Clay masonry units Incorporating Amendment:

AMD 15998 November 2005.

BS EN 877 1999+A1: 2006 Cast iron pipes and fittings, their joints and accessories for the evacuation of water from buildings. Requirements, test methods and quality assurance. Incorporating Amendment:

AMD 16741 November 2006 and Implementation of Corrigendum January 2008.

BS EN 1057: 2006+A1 2010 Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications. Incorporating Amendment:

A1 March 2010.

BS EN 1254-1: 1998 Copper and copper alloys. Plumbing fittings:

Part 1: Fittings with ends for capillary soldering or capillary brazing to copper tubes. Incorporating Amendment:

AMD 10099 July 1998

Part 2: Fittings with compression ends for use with copper tubes.

BS EN 1329-1: 2000 Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Unplasticized poly (vinyl chloride) (PVC-U):

Part 1: Specifications for pipes, fittings and the system.

BS EN 1401-1: 2009 Plastics piping systems for non-pressure underground drainage and sewerage – Unplasticized poly (vinyl chloride) (PVC-U). Specifications for pipes, fittings and the system.

BS EN 1451-1: 2000 Plastic piping systems for soil and waste discharge (low and high temperature) within the building structure – polypropylene (PP). Specification for pipes, fittings and the system. Incorporating Amendment:

AMD 13819 as Corrigendum No 1 November 2002.

BS EN 1455-1: 2000 Plastics piping systems for soil and waste (low and high temperature) within the building structure. Acrylonitrile-butadiene-styrene (ABS) Specifications for pipes, fittings and the system.

BS EN 1462: 2004 Brackets for eaves gutters. Requirements and testing.

BS EN 1519-1: 2000 Plastics piping systems for soil and waste (low and high temperature) within the building structure. Polyethylene (PE). Specifications for pipes, fittings and the system:

Also refer to BS 4514: 2001.

BS EN 1610: 1998 Construction and testing of drains and sewers.

BS EN 1916: 2002 Concrete pipes and fittings, unreinforced, steel fibre and reinforced. Incorporating Amendments:

AMD 15288 as Corrigendum No 1 July 2004
AMD 16963 as Corrigendum No 2 February 2007
Corrigendum No 3 November 2008.

BS EN 1917: 2002 Concrete manholes and inspection chambers, unreinforced, steel fibre and reinforced Incorporating Amendments:

AMD 15288 as Corrigendum No 1 July 2004
AMD 16963 as Corrigendum No 2 February 2007
Corrigendum No 3 November 2008.

BS EN 1992-1-1: 2004 Eurocode 2. Design of concrete structures. General rules and rules for buildings.

BS EN 12056-2: 2000 Gravity drainage systems inside buildings:

Part 2: Sanitary pipework, layout and calculation.

BS EN 12200-1: 2000 Plastics rainwater piping systems for above ground external use – unplasticized poly (vinyl chloride) (PVC-U):

Part 1: Specifications for pipes, fittings and the system.

BS EN 12380: 2002 Air admittance valves for drainage systems – requirements, test methods and evaluation of conformity.

BS EN 12588: 2006 Lead and lead alloys. Rolled lead sheet for building purposes.

BS EN 12620: 2002+A1: 2008 Specification for aggregates for concrete. Incorporating Amendments:

AMD 15333 August 2004 as Corrigendum No 1
Implementation of CEN amendment A1 June 2008.

BS EN 13598-1: 2003 Plastics piping systems for non-pressure underground drainage and sewerage. Unplasticized poly (vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE). Specifications for ancillary fittings including shallow inspection chambers.

BS 65: 1991 Specification for vitrified clay pipes, fittings and ducts, also flexible mechanical joints for use solely with surface water pipes and fittings Incorporating Amendment AMD 8622 May 1995.

BS 416: 1990 Discharge and ventilating pipes and fittings, sand-cast or spun in cast iron:

Part 1: 1990 Specification for spigot and socket systems.

BS 437: 2008 Specification for cast iron drain pipes, fittings and their joints for socketed and socketless systems.

BS 460: 2002+A2: 2007 Specification for cast iron rainwater goods.

BS 1091: 1963 (1980) Specification for pressed steel gutters, rainwater pipes, fittings and accessories.

BS 2997: 1958 (1980) Specification for aluminium rainwater goods.
CP 143-1: 1958 Code of Practice - Sheet roof and wall coverings:

Part 1: Aluminium, corrugated and troughed. Incorporating Amendment: PD 4346 October 1961.

BS 3868: 1995 Specification for prefabricated drainage stack units: galvanized steel.

BS 4514: 2001 Unplasticized PVC soil and ventilating pipes of 82.4 mm minimum mean outside diameter, and fittings and accessories of 82.4 mm and other sizes.

BS 4660: 2000 Thermoplastics ancillary fittings of nominal sizes 110 and 160 for below ground gravity drainage and sewerage. Incorporating Amendments:

AMD 10875 as Corrigendum No 1 March 2000
AMD 13946 as Corrigendum No 2 December 2002.

BS 5493: 1977 Protective coating of iron and steel structures against corrosion. Incorporating Amendments:

AMD 4443 January 1984
AMD 7898 November 1993.

BS 5911-1: 2002 Concrete pipes and ancillary concrete products:

Part 1: Specification for unreinforced and reinforced concrete pipes (including jacking pipes) and fittings with flexible joints complementary to BS EN 1916: 2002.

BS 5911-3: 2002 Concrete pipes and ancillary concrete products:

Part 3: Specification for unreinforced and reinforced concrete manholes and soakaways. Incorporating Amendment:

AMD 15039 May 2004.

BS 5911-4: 2002 Concrete pipes and ancillary concrete products:

Part 4: Specification for unreinforced and reinforced concrete inspection chambers. Incorporating Amendment:

AMD 15038 May 2004.

BS 6798: 2009 Specification for installation and maintenance of gas-fired boilers of rated input not exceeding 70 kW net.

BS 8000-14: 1989 Workmanship on building sites. Code of practice for below ground drainage.

BS 8110: Part 1: 1997 Structural use of concrete. Code of practice for design and construction. Incorporating Amendments:

AMD 9882 September 1998
AMD 13468 May 2002
AMD 16016 November 2005
AMD 17307 August 2007.

BS 8301: 1985 Code of practice for building drainage. Incorporating Amendments:

AMD 5904 September 1988
AMD 6580 March 1991.

Northern Ireland Water

Sewers for adoption Northern Ireland – A design and construction guide for developers in Northern Ireland (1st edition) 2010.

Other publications

Technical Booklet B: 2012 – Materials and workmanship

Technical Booklets

The following list comprises the series of Technical Booklets prepared by the Department for the purpose of providing practical guidance with respect to the technical requirements of the Building Regulations (Northern Ireland) 2012.

Technical Booklet B	Materials and workmanship
Technical Booklet C	Site preparation and resistance to contaminants and moisture
Technical Booklet D	Structure
Technical Booklet E	Fire safety
Technical Booklet F1	Conservation of fuel and power in dwellings
Technical Booklet F2	Conservation of fuel and power in buildings other than dwellings
Technical Booklet G	Resistance to the passage of sound
Technical Booklet H	Stairs, ramps, guarding and protection from impact
Technical Booklet J	Solid waste in buildings
Technical Booklet K	Ventilation
Technical Booklet L	Combustion appliances and fuel storage systems
Technical Booklet N	Drainage
Technical Booklet P	Sanitary appliances, unvented hot water storage systems and reducing the risk of scalding
Technical Booklet R	Access to and use of buildings
Technical Booklet V	Glazing

Any person who intends to demonstrate compliance with the Building Regulations by following the guidance given in a Technical Booklet is advised to ensure that the guidance is current on the date when the plans are deposited or notice given to the district council.