

Code of practice for

Sanitary pipework

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- Brewers Society
- British Bathroom Council
- British Plaster Federation
- British Plumbing Fittings Manufacturers' Association
- British Pump Manufacturers' Association
- Clay Pipe Development Association
- Consumer Policy Committee of BSI
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- Institute of Plumbing
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Foreword

This British Standard has been prepared under the direction of Technical Committee B/505 "Wastewater Engineering". It supersedes BS 5572:1978, which is withdrawn.

The recommendations on design and workmanship are based on improved technology in plumbing and research undertaken by the Building Research Establishment and product manufacturers, the results of which have been proved in practice. In particular, the sizing of pipework, the grouping of appliances for drainage purposes, the calculation of discharge flows, the jointing of pipes and fittings of varying materials and maintenance aspects have all been covered in greater detail.

This revision has come at a time when changes are likely in the ranges of pipe sizes available. This should not cause difficulty as, generally, small variations from the stated internal diameter do not critically affect performance. An exception is an unvented branch pipe serving a single wash basin, the size of which does have a pronounced effect on performance. The type of basin and trap also has an influence. Consequently, a minimum size has been quoted for this arrangement, for a particular basin and trap design. Work is in hand to provide more data for a range of pipe sizes, basin and trap types.

A new clause (5) dealing with the performance requirements of discharge pipe systems has been included and it is hoped that this can be enlarged in future revisions of this standard to enable performance to be included in more detail than is possible at present.

The drawings contained in this standard are only diagrammatic, their purpose being to complement the text and portray design principles.

The normative references are currently all British Standards. As European Standards are published they will replace the relevant British Standards and be the subject of amendment to this publication.

BSI recognizes that the European committee CEN/TC 165 is in the process of drafting a performance specification for drainage systems inside buildings, for publication in late 1995. The UK has participated in this work and expects this code of practice to be fully consistent with the requirements of the European Standard. The UK will willingly withdraw those parts of BS 5572 that are found to be either in conflict with, or the same as, the published European Standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 76, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard gives recommendations for the design, installation, testing and maintenance of above ground gravity sanitary pipework and fittings for domestic, commercial and public buildings, with the exception of trade waste discharges and any special requirements of buildings such as hospitals or research laboratories.

NOTE The term above ground includes all pipework within or on the building including any basement(s), but excluding any pipework which has entered the ground, either externally or as the result of penetrating the lowest floor level or an outer wall of the building.

2 References

2.1 Normative references

This British Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on page 76. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this British Standard only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

2.2 Informative references

This British Standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on page 76, but reference should be made to the latest editions.

2.3 Materials, appliances and components

All materials, appliances and components used in the discharge system described should conform to the relevant British Standards listed in Annex A.

3 Definitions

For the purposes of this British Standard, the definitions given in BS 6100-2.7:1992 and Section 3.3:1992 apply, some of which have been reproduced below, together with the following.

NOTE For the purposes of this standard, pipes and pipework include fittings.

3.1

access cover

a removable cover on pipes and fittings providing access to the interior of pipework for the purposes of inspection, testing and cleansing

3.2

branch discharge pipe

a *discharge pipe* connecting sanitary appliances to a discharge stack

NOTE Repeated from BS 6100.

3.3

branch ventilating pipe

ventilating pipe connected to a *branch discharge pipe*

NOTE Repeated from BS 6100.

3.4

criterion of satisfactory service

the percentage of time during which the design discharge flow loading will not be exceeded

3.5

crown of trap

the topmost point of the inside of a trap outlet

3.6

depth of water seal

the depth of water which would have to be removed from a fully charged trap before air could pass freely through the trap

3.7

discharge pipe

pipe which conveys the discharge from a sanitary appliance

NOTE Repeated from BS 6100.

3.8

discharge unit

a unit so chosen that the relative load-producing effect of sanitary appliances can be expressed as multiples of that unit

NOTE The discharge unit rating of an appliance depends on its rate and duration of discharge, on the interval between discharges and on the chosen criterion of satisfactory service. It is not a simple multiple of a rate of flow.

3.9

sanitary pipework

arrangement of *discharge pipes*, with or without *ventilating pipes*, connected to a drainage system

NOTE Repeated from BS 6100.

3.10

size

the term used in this standard to indicate the nominal internal diameter of pipes regardless of specific materials and their classification or description in other publications

NOTE The relationship between size as used in this standard and as in other publications is shown in Table 1.

3.11

stack

a main vertical *discharge* or *ventilating pipe*

3.12 stack vent

extension of a vertical *discharge pipe* above the highest *discharge pipe* connection that terminates in an end open to atmosphere

NOTE Repeated from BS 6100.

3.13 trap

pipe fitting or part of a sanitary appliance that retains liquid to prevent the passage of foul air

NOTE Repeated from BS 6100.

3.14 anti-syphon trap

a trap that includes a self-closing valve, which permits air to enter when suction occurs during discharge, to prevent siphonage

NOTE Also known as anti-vacuum trap.

3.15 resealing trap

a trap that retains sufficient liquid during a discharge to ensure a seal of at least 25 mm depth after siphonage has occurred

3.16 ventilating pipe

pipe provided to limit the pressure fluctuations within the discharge pipe system

NOTE Repeated from BS 6100.

4 Exchange of information

4.1 General

Consultation is essential between clients, architects and engineers at all stages of the design of buildings to ensure efficient and economic planning of the sanitary installations and the discharge system and the provision and positioning of ducts, in relation to the building as a whole.

Details of sewers and any precautions necessary to ensure satisfactory working of the discharge systems, for example information on the possibility of surcharging and details of statutory regulations, should be obtained from the local authority. Specific requirements of the water companies should be ascertained.

Alterations or extensions to existing work will probably need a survey and report which should include the following:

- a) the type of drainage system in use and drain and sewer loadings;
- b) details and positions of appliances connected to the system;
- c) a description of the pipework and its condition;

d) particulars of the ventilation of the pipework system;

e) the results of tests (see 10.3).

4.2 Statutory requirements

Attention is directed to the following statutory requirements relating to matters dealt with in this standard.

- a) Public Health Act 1936 and 1961 and London Government Act 1963 [1].
- b) Building Act 1984 [2].
- c) Current Building Regulations for England and Wales, Northern Ireland and Scotland [3].
- d) Sewerage (Scotland) Act 1968 [4].
- e) Food Act 1984 [5].
- f) Food Hygiene (General) Regulations 1970 [6].
- g) Health and Safety at Work etc. Act 1974 [7].
- h) Control of Substances Hazardous to Health (COSHH) Regulations 1988, 2nd edition [8].
- i) Workplace (Health, Safety and Welfare) Regulations 1992 and approved code of practice [9].
- j) Current Education (School premises) Regulations [10].
- k) Technical Regulations for Places of Public Entertainment in Greater London 1965 [11].

Users of this standard should ensure that they are referring to the latest editions of the statutory regulations mentioned.

Local authorities are responsible for the enforcement of most of the regulations and information required by them may include the following:

- 1) information on the number, position and types of appliances to be installed (BS 6465-1) and details of the proposed use of the premises;
- 2) notification on the appropriate forms and particulars of the proposed work;
- 3) drawings and specifications.

NOTE Some local authorities may have special powers or requirements in local Acts.

Before commencing the work the contractor should be in possession of copies of the drawings as approved by the appropriate authorities, together with the specification and any further working drawings and information necessary to enable the work to be carried out.

Table 1 — Equivalence between size as defined in this standard and as in other publications

Size	Iron		Copper	Steel		Plastics				Borosilicate glass	Stainless steel
	BS 416	BS 437	BS 2871	BS 1387	BS 3868	BS 3506	BS 4514 See note 2	BS 5254 See note 2	BS 5255 See note 2		
	Nominal bore	Nominal bore	Size of tube	Nominal bore	Nominal bore	Nominal size	Nominal size	Nominal size	Nominal size	Nominal bore	Nominal size
mm	mm	mm	mm	mm	mm	in	mm	in/mm	in/mm	mm	mm
25	—	—	28	25	—	1	—	—	—	25	—
32	—	—	35	32	32	1¼	—	1¼/32	1¼/32	—	—
40	—	—	42	40	40	1½	—	1½/40	1½/40	40	—
50	50	50	54	50	50	2	—	2/50	2/50	50	50
65	65	—	67	65	65	2½	—	—	—	—	—
75	75	75	76.1	80	80	3	82.4	—	—	80	75
90	90	—	—	—	—	—	—	—	—	—	—
100	100	100	108	100	100	4	110	—	—	100	100
125	125	—	133	125	125	5	—	—	—	—	—
150	150	150	159	150	150	6	160	—	—	150	160

NOTE 1 Exact pipe internal diameters can be ascertained by reference to the appropriate British Standards.

NOTE 2 These pipes are unsuitable for pumped discharges. The pressurized pipework for pumped discharges should be made from pipes of a specification intended for pressure applications. In some instances this may involve using a pipe capable of taking higher pressures than are necessary.

5 Performance

5.1 General

Discharge pipe systems should comprise the minimum of pipework necessary to carry away the discharges from sanitary appliances in the building quickly, quietly and with freedom from nuisance or risk of injury to health. It is essential that air from the discharge pipes or drainage system be prevented from entering the building.

Where one or more stub stack connections discharge to a drain, the head of that drain should be ventilated by a ventilating stack or discharge stack that terminates externally to atmosphere.

5.2 Discharge

5.2.1 General

Required discharge rates from appliances should be a primary consideration of the designer. Typical discharge rates for the UK are listed in Table 2. The sizes of outlets, traps and pipework should be such that the discharge from sanitary appliances is not unduly restricted below such values. Pipes serving more than one appliance should be sized taking account of simultaneous discharge. Table 2 also gives information on the duration and frequency of use of appliances that may be used in calculations of simultaneous discharge. A value of 99 % is recommended as a minimum criterion of satisfactory service for such calculations.

5.2.2 Exclusion of foul air

Conventional gravity discharge systems rely on water filled traps at the appliances for the exclusion of foul air from buildings. The water seal depth should, therefore, be large enough, after possible loss due to evaporation and pressure fluctuations, to prevent foul air from the discharge pipe system or drain from entering the building. For WCs there should be sufficient trap water for the containment of excreta. Additional data on traps is given in Table 3.

Pressure fluctuations should be limited in order to retain these water seals and thereby prevent foul air from entering the building. Systems designed in accordance with this standard have positive and negative pressures that do not exceed 38 mm water gauge and at least 25 mm of water seal is retained in the traps. These limitations are based on the worst likely discharge conditions.

NOTE For some situations, where the pressure and loss criteria are likely to be exceeded, resealing traps are recommended as a design solution.

5.2.3 Limitation of noise

Noise generated by discharge systems should be limited so as to maintain environmental quality in buildings. The discharge from sanitary appliances and pressure fluctuations in the pipework causing seal loss are important sources of noise, but systems designed to limit pressure fluctuations, as in **5.2.2**, will tend to be quiet. Noise may be reduced by sound insulation of the pipework from the structure and of the containing ductwork. Secure fixing of pipes will contribute to noise limitation.

5.2.4 Containment of water and air

The discharge pipework system should prevent the leakage of contaminated water and foul air into the building.

5.2.5 Resistance to blockage

The discharge pipework should be so designed as to minimize the risk of blockage.

5.2.6 Durability

The discharge system including materials, joints, supports and fixings should be durable under operating conditions.

5.2.7 Access for maintenance

Discharge pipework should be easily accessible and traceable. Access covers and/or cleaning eyes should be positioned to allow cleaning and maintenance equipment to be easily inserted into the pipework, and to permit cleaning or clearing of all parts of the system.

5.2.8 Replacement

The pipework system and fittings should be designed and installed so that defective parts can be replaced without undue difficulty.

5.2.9 Accessibility for testing

Systems should be capable of being tested to ensure that the required performance is attained. Adequate access should be provided to enable tests to be carried out.

Table 2 — Flow and usage data of some sanitary appliances

Appliance	Specified capacity	Maximum discharge rate l s^{-1}	Duration of discharge (t) s	Minimum interval of discharge (T) s	Individual probability (p) of discharge $p = \frac{t}{T}$
Washdown WC with high level cistern	9 l ^a	2.0	7	1 200	0.0058
				600	0.0117
				300	0.0233
	7.5 l ^a	2.0	6	1 200	0.0050
				600	0.0100
				300	0.0200
	6 l	2.0	5.8	1 200	0.0048
				600	0.0097
				300	0.0193
Washdown WC with low level cistern	9 l ^a	1.8	7.1	1 200	0.0059
				600	0.0118
				300	0.0237
	7.5 l ^a	1.8	6.4	1 200	0.0053
				600	0.0107
				300	0.0213
	6 l	1.8	6.2	1 200	0.0052
				600	0.0103
				300	0.0207
Washdown WC with close coupled cistern	9 l ^a	1.2	9	1 200	0.0075
				600	0.0150
				300	0.0300
	7.5 l ^a	1.2	8	1 200	0.0067
				600	0.0133
				300	0.0267
	6 l ^a	1.2	6.5	1 200	0.0054
				600	0.0108
				300	0.0217
Washdown WC fitted with a macerator	9 l ^a	0.4	31	1 200 600 300	0.0258 0.0517 0.1033
	7.5 l ^a	0.4	30	1 200 600 300	0.0250 0.0500 0.1000
	6 l	0.4	29	1 200 600 300	0.0242 0.0483 0.0967

Table 2 — Flow and usage data of some sanitary appliances

Appliance	Specified capacity	Maximum discharge rate l s^{-1}	Duration of discharge (t) s	Minimum interval of discharge (T) s	Individual probability (p) of discharge $p = \frac{t}{T}$
Urinal (per person unit)	2.5 l	0.15	20	1 200	0.0167
Wash basin (32 mm branch)	6 l	0.6	10	1 200 600 300	0.0083 0.0167 0.0333
Sink (40 mm branch)	23 l	0.9	25	1 200 600 300	0.0208 0.417 0.0834
Food waste disposal unit		0.2	90	1 500	0.006
Bath (40 mm branch)	80 l	1.1	75	4 500 1 800	0.0167 0.0417
Spray tap basin		0.06			
Electric shower	7 kw to 8 kw	0.07	300	1 200 86 400	0.0250 0.0035
Low pressure shower (per Spray head)	≤ 0.6 bar head ^b	0.15	300	1 200 86 400	0.0250 0.0035
High pressure shower (per Spray head)	> 0.6 bar head ^b	0.15 to 0.35	300	1 200 86 400	0.0250 0.0035
Automatic washing machine	4 kg to 5 kg dry load	0.6	30	240 Note 1 900 15 000	0.1250 0.0333 0.0200
Dish washing machine	12 to 14 place settings	0.25	20	180 Note 2 1 200 86 400	0.1110 0.0166 0.0002

NOTE 1 A washing machine will discharge at various intervals during any selected programme. The maximum number of discharges will be 6 and the volume discharged each time will be in the order of 20 l. Hence:

240 s represents the minimum time between rinses;

900 s represents a mean discharge interval of 15 min during the use of the machine;

15 000 s represents a 4.2 h interval between uses of the machine.

NOTE 2 A dishwasher will discharge at various intervals during any selected programme. The maximum number of discharges will be 5 and the volume discharged each time will be in the order of 6 l. Hence:

180 s represents the minimum time between rinses;

1 200 s represents a mean discharge interval of 20 min during the use of the machine;

86 400 s represents daily use of the machine.

The above data applies to 1990 models; older machines will generally discharge greater volumes at lower flow rates for longer periods e.g. a 1970s washing machine would discharge at about 0.1 l/s for around 3 min.

NOTE 3 For discharges from non-domestic appliances see 6.7.1.1.

^a British Standard WC cistern capacities have the following tolerances $9 \text{ l} \pm 0.5 \text{ l}$ (BS 1125) $7.5^{+0}_{-0.5} \text{ l}$ (BS 7357).

^b 1 bar = $10^5 \text{ N/m}^2 = 10^5 \text{ Pa}$.

5.3 Hydraulics and pneumatics of discharge systems

5.3.1 General

For design purposes it is convenient to consider separately the effects of the flow in branch discharge pipes and the flow in discharge stacks.

5.3.2 Branch discharge pipes

Loss of water seal from the trap of a discharging appliance may occur by self-siphonage if the branch discharge pipe flows at full bore. Traps on appliances not discharging may also suffer seal loss by induced siphonage if the branch discharge pipe to which they are connected is flowing full bore or if conditions of flow in the vertical stack create negative pressure. These seal losses (see Figure 1) will be affected by the following:

- the design of the appliance, e.g. funnel-shaped appliances increase the chance of self-siphonage;
- the length, slope and size of the pipe;
- the type of trap and waste fittings, grid design and free cross-sectional area at the outlet;
- whether or not the appliance has an overflow which is connected into the waste fitting or to the trap;
- the design of pipework fittings, particularly bends;
- the provision or not of a branch ventilating pipe.

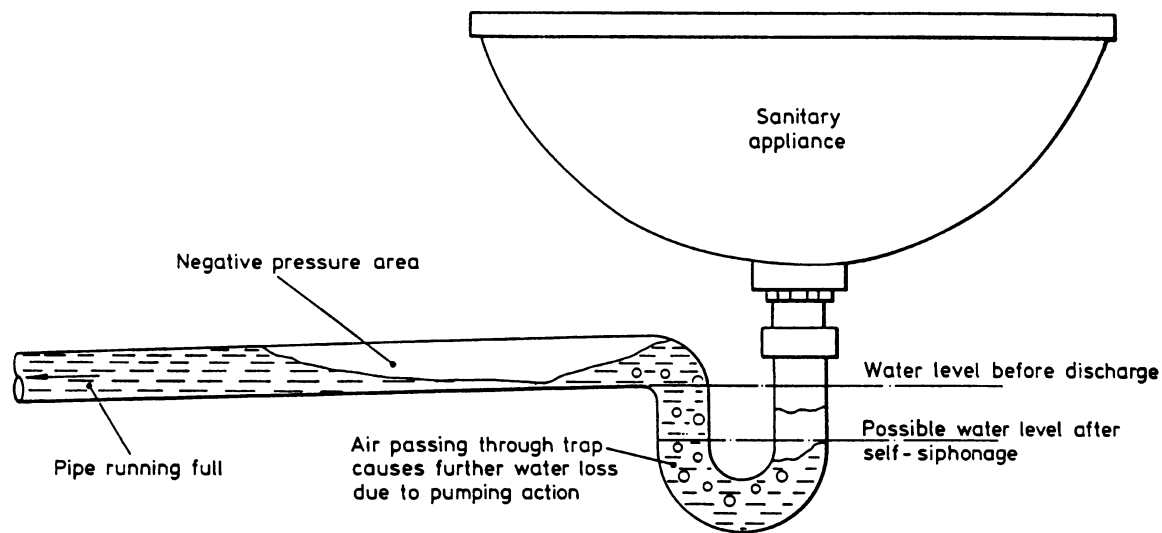
5.3.3 Discharge stacks

Water flowing in discharge stacks will cause air pressure fluctuations. Suction can occur below discharging branch connections and offsets, causing water seal loss by induced siphonage from appliances connected to the stack. Back pressures or positive pressures can occur above offsets and bends in stacks causing foul air to be blown through the trap water seal and, sometimes, seal loss. These seal losses (see Figure 2) will be affected by the following:

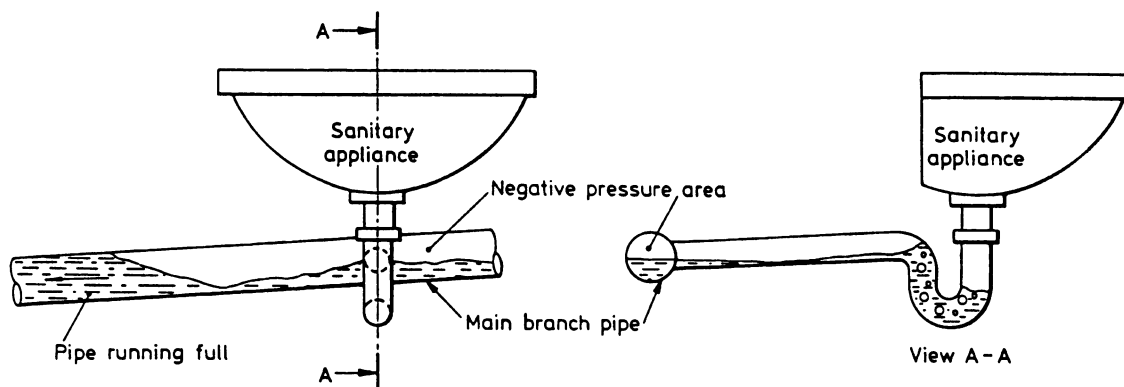
- the flow load, depending on the total number and type of appliances connected to the stack, their distribution on each floor of the building and the frequency with which they are used;
- the height and diameter of the stack, excessive seal losses being prevented by selecting the size of stack appropriate to the number of appliances connected to it and the height of the building;
- the design of pipe fittings, particularly the shape and size of branch inlets and the radius of the bend at the base of the stack connecting it to the drain;
- changes of direction in the wet portion of the discharge stack;
- provision, or not, of a ventilating pipe;
- surcharging of the drain;
- provision, or not, of an intercepting trap in the drain.

Table 3 —Trap seal loss data

Typical seal loss (due to negative pressure (suction) of 325 N/m ² (38 mm water gauge) in discharge systems)		Typical evaporation loss	
Trap details	Approximate seal loss mm	Trap detail	Accepted average figure per week mm
Typical washdown WC, 50 mm seal depth	25	Small and large bore traps	2.5
Small diameter tubular trap, 50 mm or 75 mm seal depth	19		

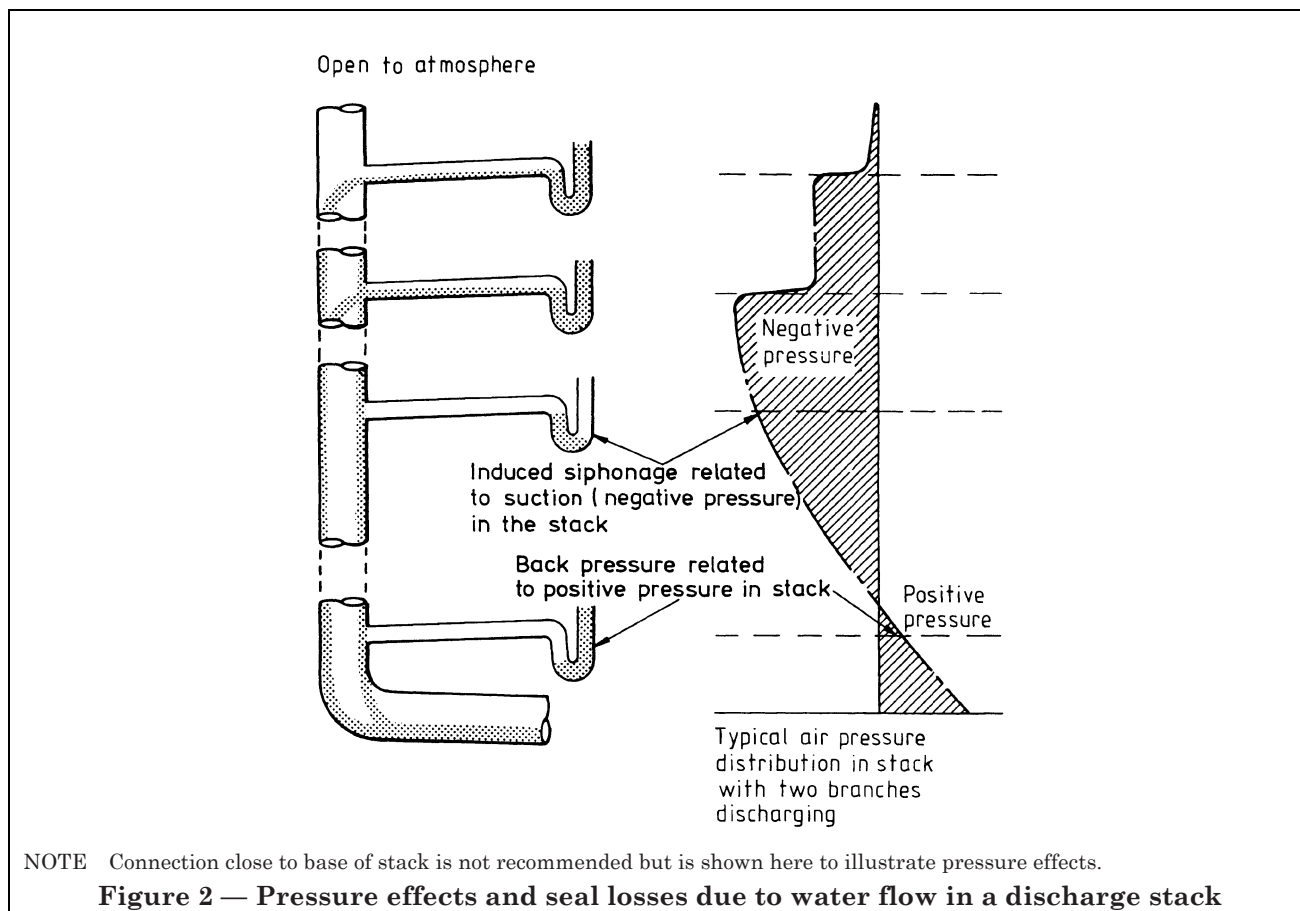


a) Self-siphonage (at the end of an appliance discharge)



b) Induced siphonage (due to full bore flow in a main branch discharge pipe)

Figure 1 — Seal loss due to flow in branch pipes



5.3.4 Additional information on discharge stacks

5.3.4.1 Shape and size of branch inlets

Suction produced in the discharge stack below discharging branch inlets is affected by the radius or slope of the branch inlet. A large radius or a 45° entry will tend to minimize the amount of the suction but a near horizontal entry with a small radius will tend to have the opposite effect. Branch inlets which are significantly smaller in diameter than the stack are not so critical in this respect (see 6.3.2.5).

5.3.4.2 Bends and offsets

Sharp bends at the base of a stack can cause large back pressures due to restriction of the stack air flow and, similarly, offsets of less than 3 m length in the wet part of a stack can produce large pressure fluctuations. Changes in stack direction can also cause foaming of detergents and consequent pressure fluctuations (see 6.3.3.2 and 7.3.2).

5.3.4.3 Surcharging of the drain

If the drain to which the discharge stack is connected is surcharged, the normal flow of air down the stack during discharge is interrupted and high back pressures can occur. Under these conditions additional stack ventilation will be required (see 7.3.3). Lightly loaded stacks, however, do not require additional stack ventilation, i.e. dwellings of no more than three storeys.

5.3.4.4 Intercepting traps

In a situation where a single discharge stack is connected to a drain fitted with an intercepting trap in close proximity, large pressure fluctuations can occur. Additional stack ventilation may then be necessary (see 7.3.3).

5.3.4.5 Wind effects

Wind blowing across roofs can produce pressure fluctuations in the vicinity of parapets and corners of the building. If discharge or ventilation stacks are terminated in these areas unacceptable pressure fluctuations can be developed in the discharge system (see 6.3.3.7).

5.3.4.6 Admission of rainwater into discharge stacks

In some areas with combined drainage systems, discharge stacks are permitted to receive rainwater from roof areas. However, rainwater pipes are not permitted to receive foul or waste discharges. The rainwater outlet should be trapped unless it is in a position where termination of a stack vent is permitted. In very long stacks, e.g. a 30 storey building, quite small continuous flows of rainwater can cause excessive pressure fluctuations. There is also the danger of flooding if a blockage occurs in the discharge stack or underground drain during a heavy rainstorm especially if the roof area served is large (see 6.3.3.5, 6.3.3.6 and 6.3.3.7).

Consequently it is generally recommended that the practice is limited to roof areas of not more than 40 m² per stack and to buildings of not more than 10 storeys in height. Within these limitations the appropriate data in Table 5 can be used with no increase in ventilating stack size (see 5.2.2).

5.3.4.7 Effects of pumped or ejected discharge

Where it is necessary to pump or eject the effluent, the method of discharge to the building drainage system should be such that the rate of flow and the location of the discharge will not cause pressure fluctuations which might adversely affect the performance of the gravity system.

The exhaust compressed air from pneumatic ejectors should not be discharged into the gravity drainage ventilation system but should be discharged to atmosphere separately.

5.3.5 Description of discharge systems

The discharge systems can conveniently be classified as follows.

a) *Ventilated system* (see Figure 3)

A ventilated system is used in situations where there are large numbers of sanitary appliances in ranges or where they have to be widely dispersed and it is impracticable to provide discharge stack(s) in close proximity to the appliances. Trap seals are safeguarded by extending the discharge and ventilating stacks to atmosphere and providing individual branch ventilating pipes.

b) *Ventilated stack system* (see Figure 4)

A ventilated stack system is used in situations where close grouping of appliances makes it practicable to provide branch discharge pipes without the need for branch ventilating pipes. Trap seals are safeguarded by extending the stack(s) to the atmosphere and by cross-connecting the ventilating stack to the discharge stack.

c) *Single stack system* (see Figure 5 and Figure 6)

A single stack system is used in situations as described in b) but only where the discharge stack is large enough to limit pressure fluctuations without the need for a ventilating stack.

A modified single stack system, providing ventilating pipework extended to the atmosphere or connected to a ventilating stack, can be used where the disposition of appliances on a branch discharge pipe could cause loss of their trap seals. The ventilating stack need not be connected directly to the discharge stack and can be smaller in diameter than that required for a ventilated stack system.

6 Design

6.1 General

Recommendations in this standard are based, wherever possible, on appliances, pipes and fittings that conform to British Standards.

This clause and clauses 7 and 8 give detailed design data for the following:

- a) domestic buildings including bungalows, houses, multi-storey flats and halls of residence. Typical features of these installations are single appliances connected to, and often closely grouped round, a discharge stack;
- b) non-domestic buildings such as offices, factories, schools and other types of public buildings. Typical features of these installations are ranges of appliances connected to the discharge stack by main branch discharge pipes. Generally, appliances cannot be so closely grouped round the stack as in domestic buildings.

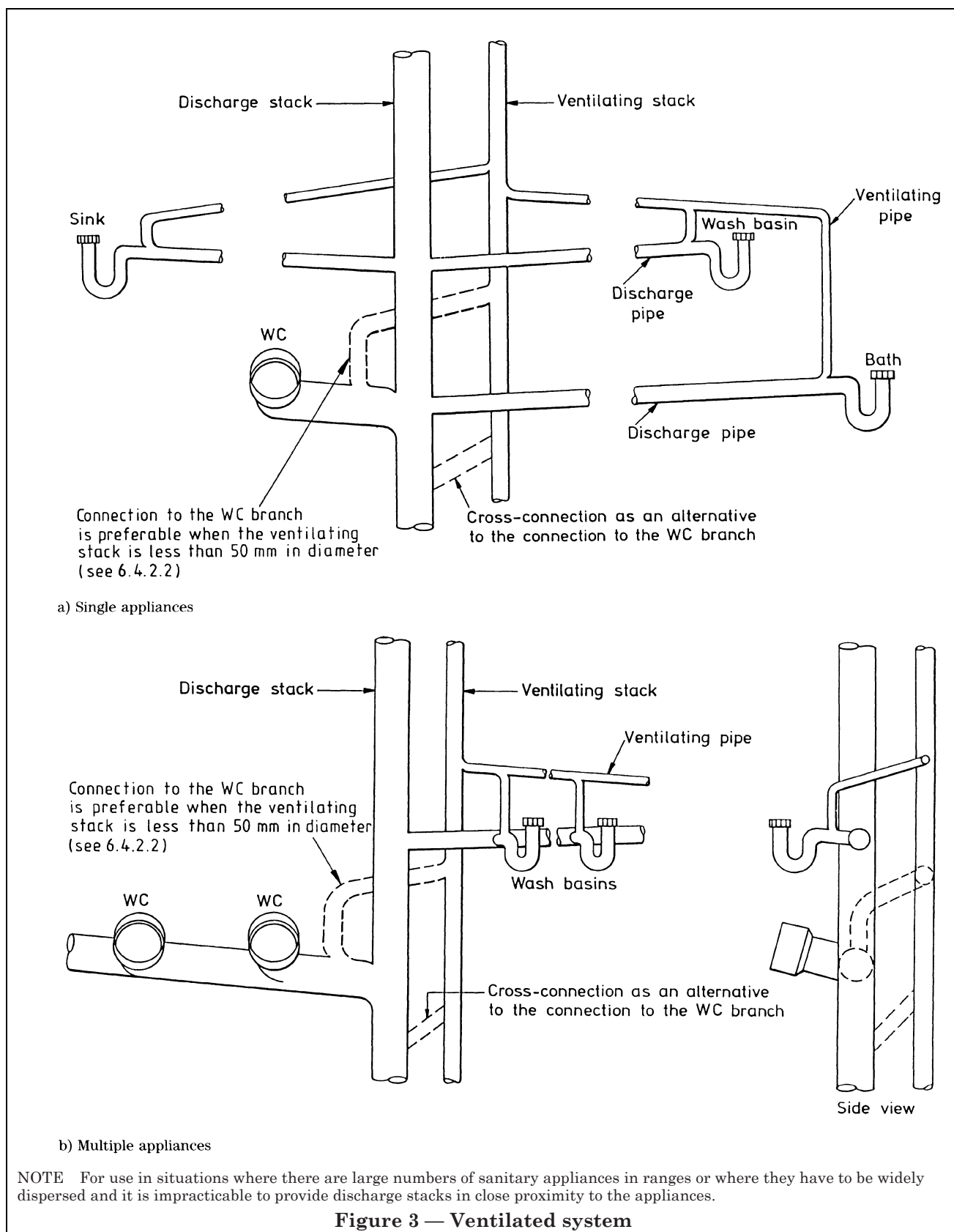
6.2 Traps (see Figure 7)

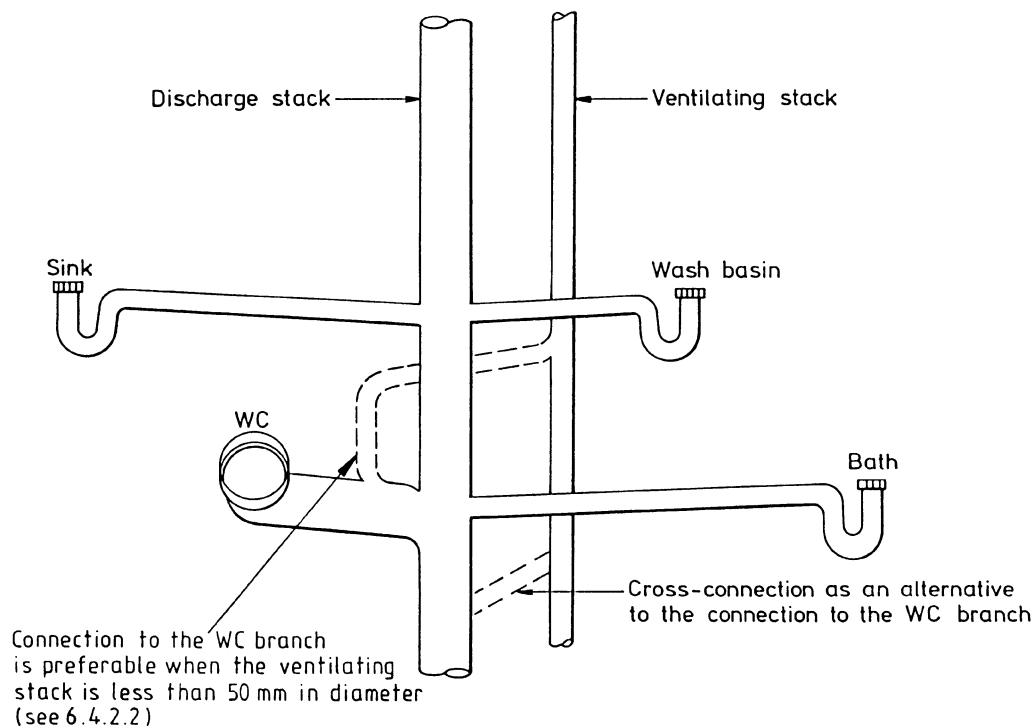
6.2.1 General

Designs in this standard are based on the use of traps with the basic dimensions as given in 6.2.2 and 6.2.3.

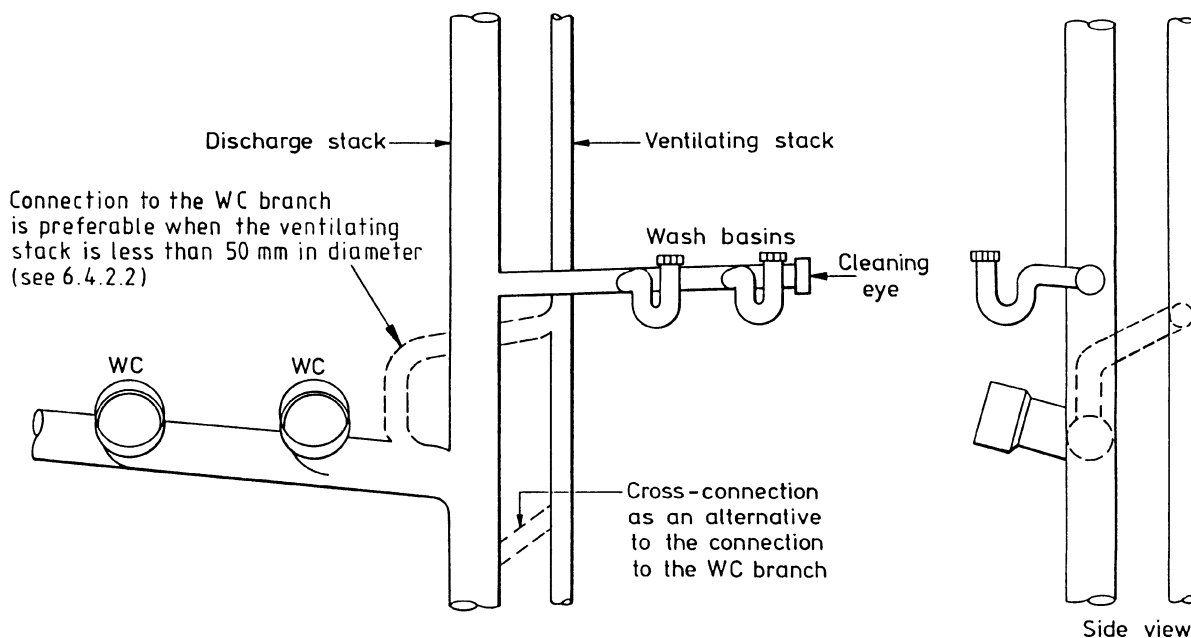
Traps should be designed so that deposits do not accumulate. A trap which is not an integral part of an appliance should be attached to, and be immediately beneath, its outlet and be self-cleansing. The internal surface of the trap should be smooth throughout (see 5.2.5).

All traps should be accessible and provided with an adequate facility for cleansing. There can be advantages in providing traps which are capable of being readily removed or dismantled (see 5.2.7).





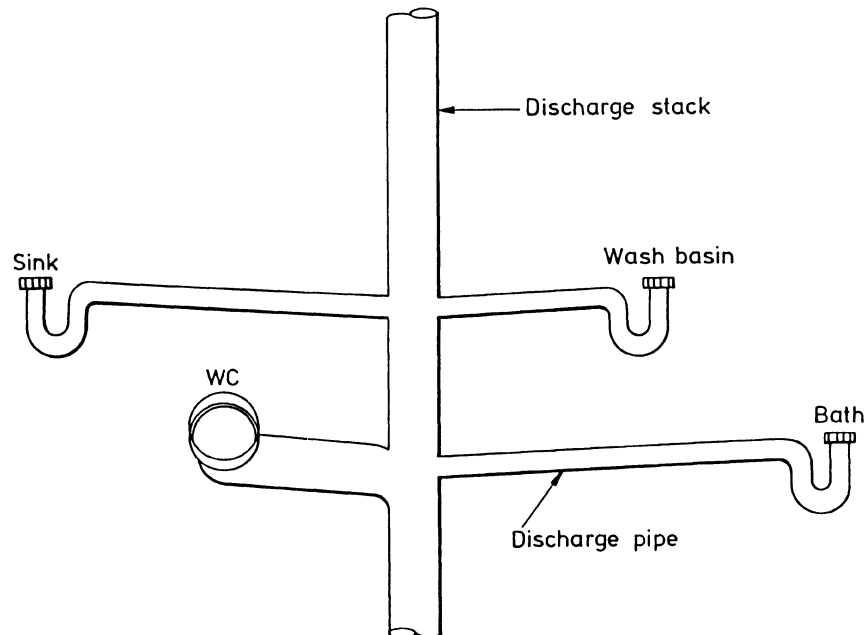
a) Single appliances



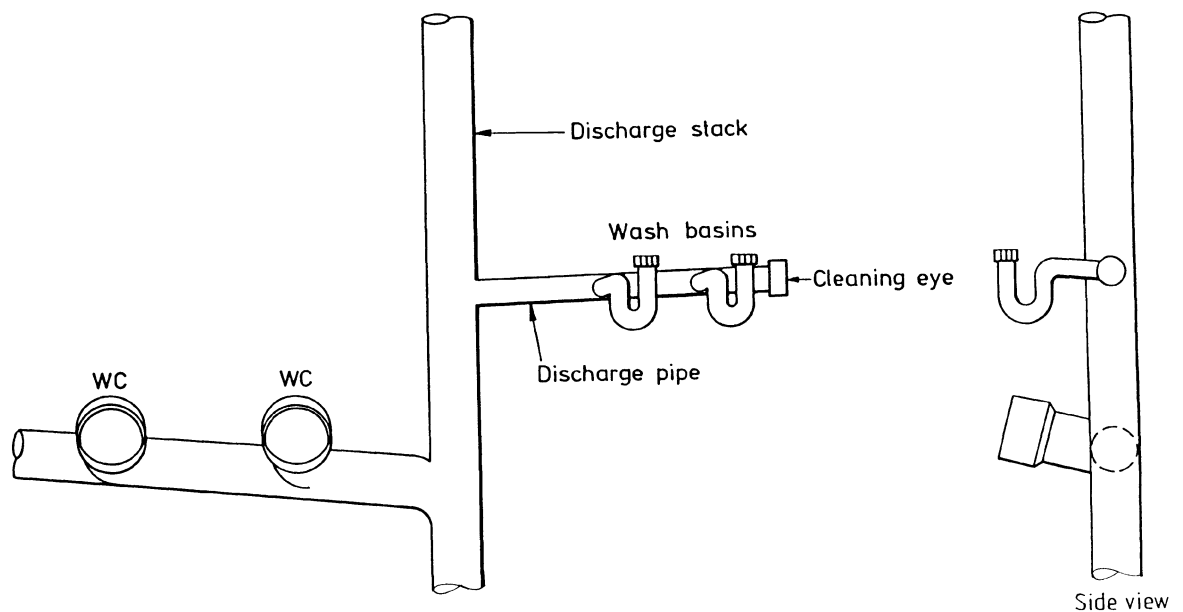
b) Multiple appliances

NOTE For use in situations where close grouping of appliances makes it practicable to provide branch discharge pipes without the need for branch ventilating pipes.

Figure 4 — Ventilated stack system



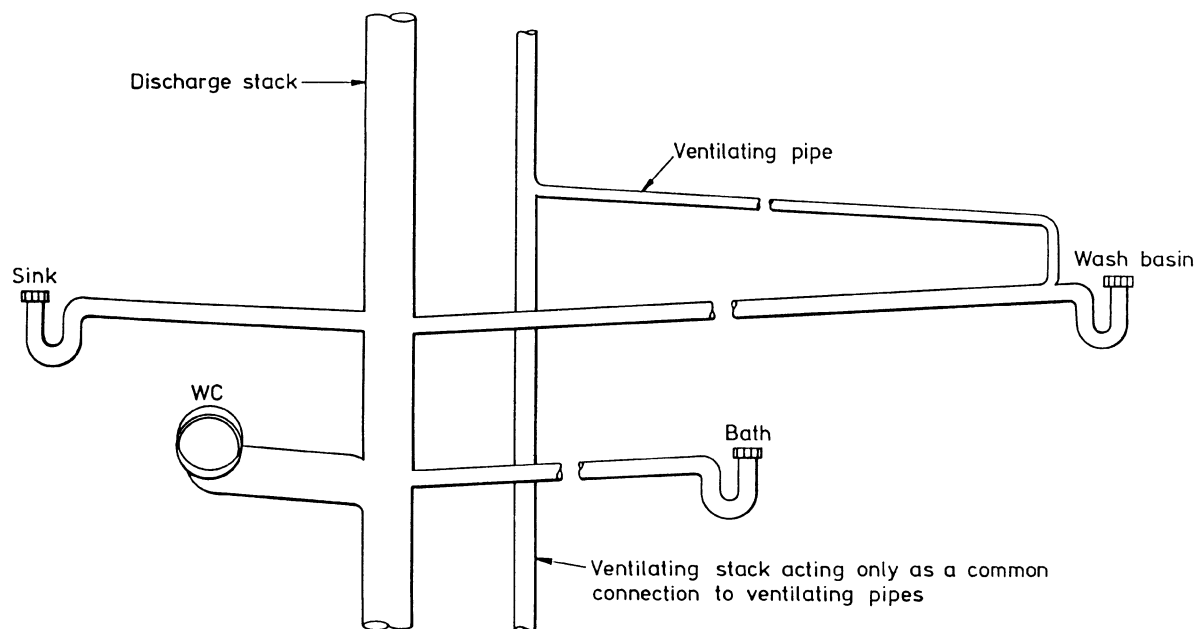
a) Single appliances



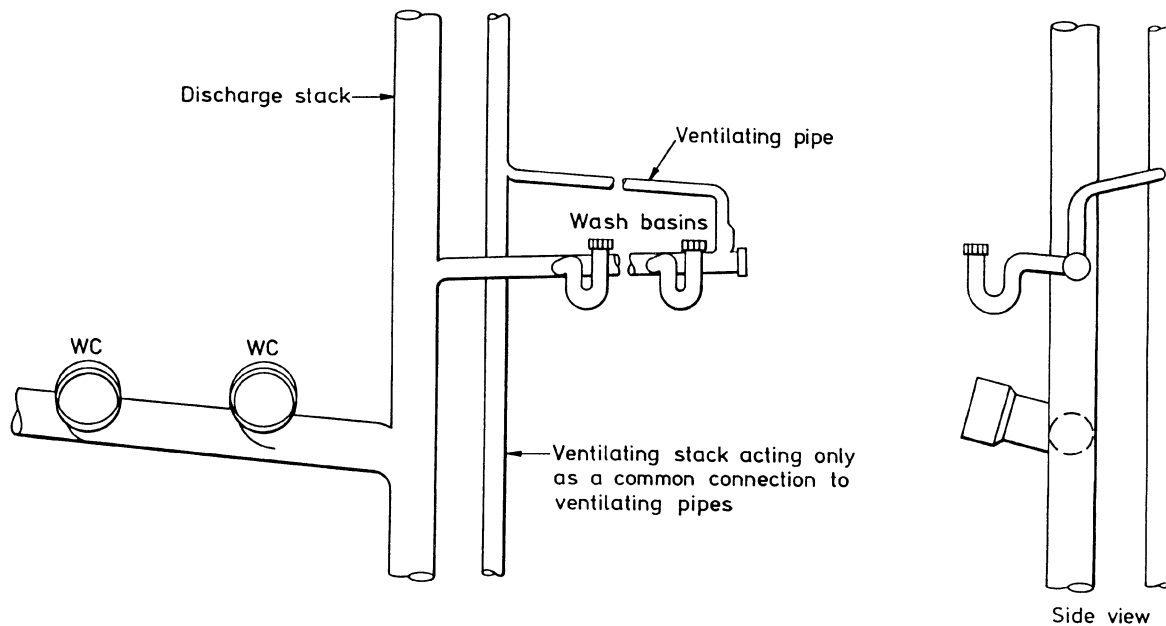
b) Multiple appliances

NOTE For use in situations described in the note to Figure 4, but where the discharge stack is large enough to limit pressure fluctuations without the need for a ventilating stack.

Figure 5 — Single stack system



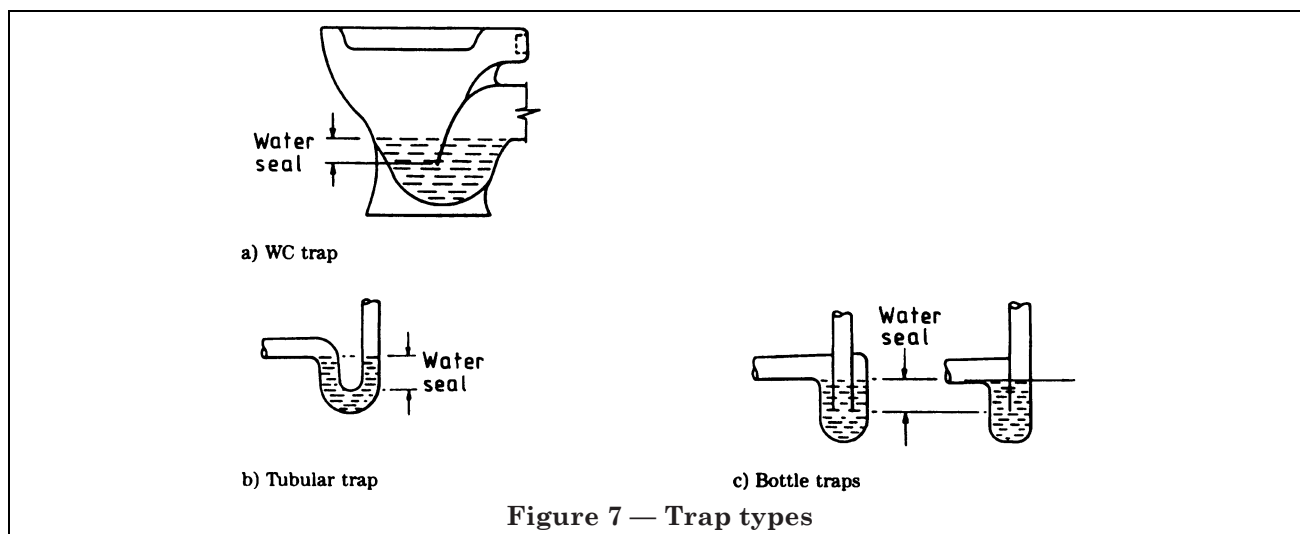
a) Single appliances



b) Multiple appliances

NOTE For use in situations where the disposition of appliances on a branch discharge pipe could cause loss of their trap seals (by the provision of ventilating pipework extended to the atmosphere or connected to a ventilating stack).

Figure 6 — Modified single stack system



6.2.2 Depth of seals

Traps with outlets for pipes up to and including 50 mm size should have a minimum water seal of 50 mm on baths and shower trays, and on spray-tap basins provided they are fitted with flush-grated wastes without plugs, and 75 mm on all other appliances (see 5.2.2).

Traps with outlets for pipes over 50 mm size should have a minimum water seal of 50 mm (see 5.2.2).

Traps used on appliances with a trailing waste discharge and installed on ground floors and discharging to an external gully may have a reduced water seal of not less than 38 mm (see 5.2.2 and 6.3.2.7).

Table 4 — Minimum sizes of tubular traps

Type of appliance	Size of trap mm	Type of appliance	Size of trap mm
Wash basin	32		
Bidet	32		
Sink	40		
Bath	40		
Shower bath tray	40	Urinal (bowl)	40
		Urinals (1 to 7 stalls or slab of equivalent length) ^a	65
Drinking fountain	32	Food-waste disposal unit (domestic)	40
Bar well	32	Food-waste disposal unit (industrial type)	50
		Sanitary towel macerator	40

^a Where there are more than seven stalls or a slab of equivalent length in one range, more than one outlet should be provided.

6.2.3 Diameters of tubular traps

The sizes of tubular traps should be not less than those given in Table 4 (see 5.2).

6.2.4 Bottle traps

This type of trap in which the division between the inlet and outlet legs is formed by a dip tube or vane within the body of the trap, the lower part of the trap being removable for access, should be designed to conform to 6.2.1 and 6.2.2. The size of inlet and outlet should be as given in 6.2.3 and there should be no reduction in flow area through the trap. Bottle traps are often used in conjunction with wash basins where the trap is exposed, or where there may be difficulty in fitting a tubular trap.

6.2.5 Resealing traps

These are specially designed traps for unventilated small size discharge pipes fitted to appliances where, because of the arrangement of the pipework, siphonage would otherwise occur. They will become less efficient in resealing if the recommendations of 6.2.1 are not met. Resealing traps should be regularly inspected and maintained. Some types can be noisy in operation (see 5.2.3).

The depth of seals should be as given in 6.2.2, the sizes at inlet and outlet should be as given in 6.2.3 and there should be no reduction in flow area through the trap.

6.2.6 Floor drainage gullies

Trapped floor drainage gullies are normally connected to branch pipes of 75 mm size or larger and are therefore not subject to seal loss due to self-siphonage. Infrequent use can however lead to total loss of seal due to evaporation. Consequently, these traps should only be specified for areas where the usage will ensure that the trap seal is maintained (see 5.2.2).

6.2.7 Sinks and washing machines

It is preferable that traps are positioned immediately beneath sink waste outlets, however a single trap may receive the discharges from two adjacent sinks and also from a domestic washing machine and/or dishwasher provided the total length of pipework joining the waste outlet of the sinks to the trap inlet does not exceed 750 mm.

6.3 Discharge pipes and stacks

6.3.1 General

It is convenient to deal with branch discharge pipes and discharge stacks separately because of their different performance characteristics.

Branch discharge pipes and discharge stacks should be installed inside buildings but for buildings up to three storeys, discharge stacks and branch discharge pipes may be installed externally.

6.3.2 Branch discharge pipes

6.3.2.1 Diameter

Branch pipes should not be reduced in diameter in the direction of flow. Sizes are given in clauses 7 and 8. Oversizing branch pipes to avoid self-siphonage problems can be uneconomic and can lead to an increased rate of deposit accumulation (see 5.2.1 and 5.2.5).

6.3.2.2 Gradients

The gradient of a branch discharge pipe should be uniform and adequate to drain the pipe efficiently. Practical considerations usually limit the minimum gradient to 1° or $1\frac{1}{4}^\circ$ (18 mm/m or 22 mm/m), but flatter gradients down to $\frac{1}{2}^\circ$ (9 mm/m) may be imposed on long runs of 100 mm and 150 mm size pipe when space is restricted. This can be undesirable and adequate self-cleansing of such an arrangement is only possible with high flow rate (e.g. of not less than 2.5 l/s) and workmanship of a high standard (see 5.2.5).

Pipes sizes, gradients and pipe capacities are inter-related as shown in clause 7 and this relationship is vital for the 32 mm branches normally connected to wash basins. Vertical 32 mm branch pipe from wash basins with “s” traps often run full bore and ventilating pipework may be needed to prevent self-siphonage and noisy discharge (see 5.2.2 and 5.2.3).

6.3.2.3 Lengths

Branch discharge pipes, especially those serving wash basins and urinals, should be kept as short as practicable to reduce both self-siphonage effects and the accumulation of deposits. Large diameter branches serving WCs present fewer problems in these respects (see 5.2.2 and 5.2.5).

6.3.2.4 Branch pipe bends and junctions

Bends in branch discharge pipes should be avoided, especially for single and ranges of wash basins, as they can cause blockages and increase self-siphonage effects. When they are unavoidable they should be of large radius. Precise information on bend radii for branch pipe arrangements to various appliances is given in clause 9 (see 5.2.2 and 5.2.5).

Junctions between branch discharge pipes of about the same diameter should be swept in the direction of flow using swept entry branches, with a 25 mm minimum root radius, e.g. Figure 22; otherwise 45° branches should be used. To minimize the risk of blockage, branches up to 40 mm size joining larger diameter horizontal branches of 100 mm or over should, if practicable, connect to the upper part of the pipe wall of the larger branch. For the same reason, opposed branch connections in the horizontal plane to a main branch discharge pipe should be avoided (see 5.2.5).

For a combined branch to which a wash basin is connected, the shape of a tee junction fitting can have an especially significant effect on performance, unless swept in the direction of flow (see 5.2.2 and 7.2.2.7).

6.3.2.5 Branch pipe connections to discharge stacks

6.3.2.5.1 General (see Figure 8)

Small diameter branch discharge pipes up to 65 mm size may be connected to stacks of 75 mm or larger by swept or unswept branch connections and some change in gradient close to the stack is permissible to allow the use of a standard $87\frac{1}{2}^\circ$ branch boss. However, for 32 mm pipes serving wash basins the root radius should be not greater than 25 mm (see Figure 8 b) and the change in gradient should be within 250 mm from the stack (see 5.2.2).

A branch inlet of 75 mm to 150 mm size joining a discharge stack of equal diameter should be swept in the direction of flow with a radius of not less than 50 mm for angles of $89\frac{1}{2}^\circ$ to $67\frac{1}{2}^\circ$ (see Figure 8 c) i) (see 5.2.2).

Branch pipe connections at 45° or less do not need swept inlets (see Figure 8 c) ii).

Branch inlets of 75 mm size joining 100 mm or 150 mm discharge stacks and branch inlets of 100 mm joining 150 mm stacks may be swept or unswept (see Figure 8 c) iii).

Branch discharge pipes should not discharge over a hopper head.

6.3.2.5.2 Waste manifolds

Branch discharge pipes may connect to a waste manifold [see Figure 8 d)] providing there is no restriction of cross-sectional area of the pipework connecting to it and it is designed to prevent cross flow of the discharge. Pipework connecting to waste manifolds should be installed in such a manner as to prevent self-siphonage (see 5.3.1 and 7.2.2).

6.3.2.6 Prevention of cross flow (see Figure 9)

Where small diameter branch discharge pipes without swept entries are opposed, they should be arranged so that the risk of the discharge from one branch into the other is avoided (see 5.2.5).

To prevent the discharge from a large diameter branch (e.g. a WC branch) backing up a smaller diameter branch (e.g. a bath branch) the latter should be connected to the stack so that its centre line meets the centre line of the stack at or above the level at which the centre line of the large branch meets the centre line of the stack, or at least 200 mm below it. Similar rules apply to opposed small diameter branches (see Figure 9) (see 5.2.5).

A branch creates a no connection zone on a stack, as shown shaded in Figure 9. No other branch may be fitted such that its centre line falls inside a zone, but its centre line may be on the boundary of the zone.

6.3.2.7 Direct connections to an underground drain

6.3.2.7.1 Gullies

It is often convenient on the ground floor of buildings to discharge the waste water from some appliances, e.g. baths, wash basins and sinks, into an external gully. The appliances should be fitted with suitable traps and the discharge pipes should terminate below the grating but above the water level in the gully.

This arrangement usually requires a length of vertical, or near vertical, discharge pipe which can cause self-siphonage of the trap seals and some noise. The former is not so likely with baths and sinks because trail off at the end of discharges will refill the traps sufficiently but wash basins branches may require venting. However, in suitable circumstances a resealing trap may be fitted. Noisy discharges can only be prevented by venting (see 5.2.2 and 5.2.3).

6.3.2.7.2 WC connections

WCs can be connected directly to a drain, without individual venting, provided that the vertical distance from the crown of the trap to the invert of the drain is not more than 1.5 m (see 5.2.2).

6.3.2.7.3 Stub stacks

A stub stack consists of a short straight 100 mm discharge stack with the top closed, preferably with an access fitting. It can be used to connect various appliances to a drain or discharge stack providing the total loading does not exceed 17 discharge units and the centre line of the WC branch is not more than 1.5 m and the centre line of the topmost connection is not more than 2.5 m above the invert level of the drain or branch discharge pipe (see Figure 10 a). Where one or more stub stack connections discharge to a drain, the head of that drain should be ventilated by a ventilating stack or discharge stack that terminates externally to atmosphere.

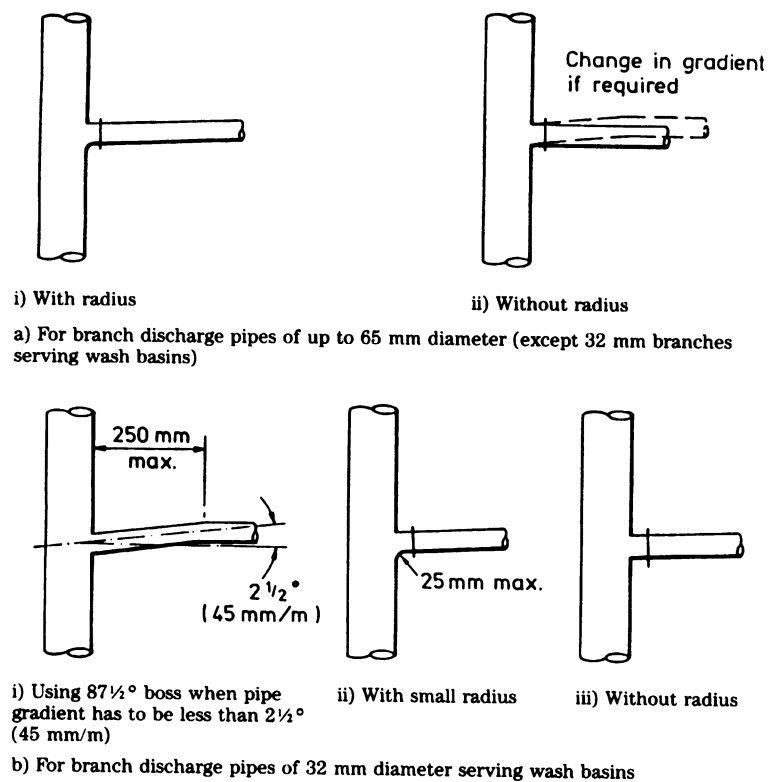
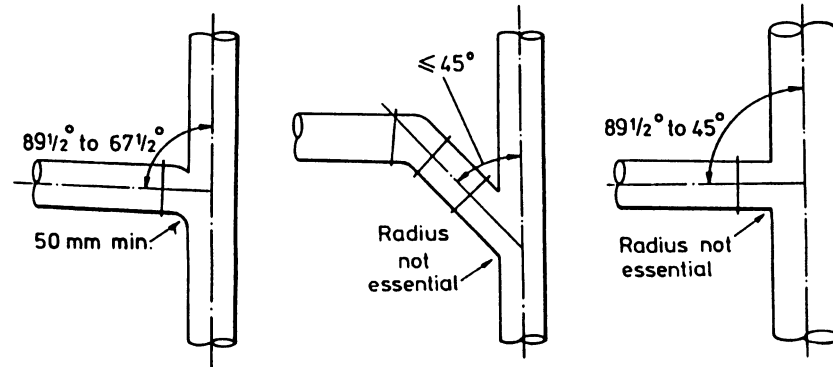


Figure 8 — Branch discharge pipe connections to discharge stacks

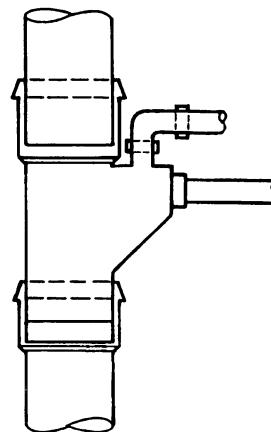


i) Equal branch

ii) Equal branch

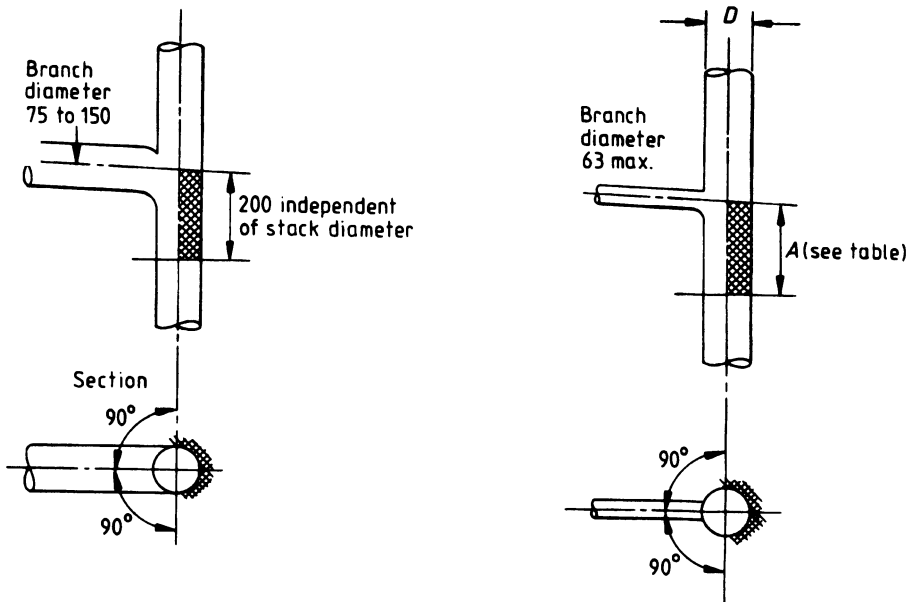
iii) Unequal branch

c) For branch discharge pipes of 75 mm to 150 mm diameters (connected to stacks of up to 150 mm diameter)



d) Typical waste manifold

Figure 8 — Branch discharge pipe connections to discharge stacks (*concluded*)



Stack dia. <i>D</i>	Height of zone <i>A</i>
75	90
100	110
125	210
150	250

i) No connection zone opposite a large branch

ii) No connection zone opposite a small branch

Linear dimensions in millimetres.

a) No connection zones for prevention of cross flow

Figure 9 — Prevention of cross flow