CHAPTER 9: Building Services

CONTENTS

FUNCTIONAL REQUIREMENTS

9.1 DRAINAGE (BELOW GROUND)

Workmanship

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ii. All work is to be carried out by a technically competent person in a workmanlike manner.

Materials

i. All materials should be stored correctly in a manner that will not cause damage or deterioration of the product.
ii. All materials, products and building systems shall be appropriate and suitable for their intended purpose.
iii. The structure shall, unless specifically agreed otherwise with the Warranty provider, have a life of not less than 60 years. Individual components and assemblies, not integral to the structure, may have a lesser durability, but not in any circumstances less than 15 years.

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i. The design and specifications shall provide a clear indication of the design intent and demonstrate a satisfactory level of performance.
ii. The materials, design and construction must meet the relevant regional building regulations.

Limitations of Functional Requirements

i. The Functional Requirements are limited by the recommendations applied to the specific areas covered in this chapter.
ii. These Functional Requirements do not and will not apply to create any policy liability for any remedial works carried out by the contractor or otherwise, nor to any materials used in those remedial works.

9.1 Introduction

This Chapter provides direction on achieving the technical requirements for below ground drainage.

General

Drainage shall be designed, constructed and installed so that they:

- Conform to all relevant statutory requirements.
- Do not adversely affect the structural stability of the housing unit.
- Prevent the entry of hazardous ground substances, external moisture or vermin.
- Are constructed using non-hazardous materials.
- Are durable and robust.
- Are safe and convenient in use.

9.1.1 Drainage

A trapped gully should be provided where impervious surfaces such as drives, paths and hard standings drain to a rain water drainage system. Impervious surfaces can drain to a permeable area within the garden providing it is free draining.

The drainage system, including manholes, gullies, pipe connections, etc, should be protected from damage throughout the course of the construction works.

9.1.2 Pipework

Where ground movement is likely to occur, flexible drainage systems should be provided, e.g. filled sites, mining areas and sites with shrinkable clay.

Where possible, avoid passing adjacent to tree roots. Adequate precautions should be taken where this cannot be avoided, in accordance with the recommendations of the relevant Building Control body and the Pipe Manufacturer.

Drainage trench excavations should be taken down to solid ground, but when this is not possible, the drainage system should be designed to accommodate any movement and made-up with a well-compacted backfill to the required formation levels.

The depths of drains and the protection provided over them needs to be adapted to the traffic normal for the location, in accordance with the recommendations of the relevant Building Control body and the Pipe Manufacturer. Requirements are as follows:

- Pipes should be laid to an even gradient, and significant changes in gradient should be combined with an access point.
- Pipes should be laid in straight lines, but may be laid to slight curves, providing the length of drain can be effectively cleaned by the use of rods.
- Connections should be to inspection chambers or manholes, but connections to junctions are acceptable if access is provided to clear blockages. In all cases, discharge should be in the direction of flow.
- Bends should be positioned in, or adjacent to, terminal fittings, inspection chambers or manholes, and at the foot of discharge stacks. Bends should have as large a radius as practicable.
- The system should be ventilated at or near the head of each main drain to allow free passage of air throughout; the maximum length of any branch serving a single appliance being 6m, and for a group of appliances, 12m.
- Where appliances are not fitted with integral traps at the point of discharge, a trap must be provided using either a trapped gully or low back trap.

9.1.3 Drainage materials

Drain materials should comply with either:

- BS 1194 – Concrete porous pipes
- BS 65 or BS 1196 – Clayware pipes
- BS 4962 – Plastic pipes

Land drains are to be laid to a uniform gradient with falls of not less than 1:200 and as recommended by the Pipe Manufacturer.

9.1.4 General backfill

In normal circumstances, the excavated material from the trench will be appropriate for backfilling above the chosen material. General backfill materials must be free from:

- Boulders
- Building rubble
- Timber
- Vegetable matter

Backfill needs to be positioned in layers not deeper than 300mm, and must be well compacted. When compacted backfill is at least 450mm above the crown of the pipe, only mechanical compacting should be used.

9.1.5 Drain protection adjacent to foundations

Drains are to be located so that foundation loads are not transmitted to pipes. Where drainage trenches are located near to foundations, foundation depths should be increased or the drain re-routed further from the foundations.

The trench should be filled with concrete to an appropriate level where the bottom of a trench is below foundation level.

Walls should accommodate movement where drains pass through substructure by:

- 50mm clearance all round
- A sleeve with a 50mm clearance
- (If built in) a connection on both sides of the wall to pipes with flexible joints located no more than 150mm from the face of the wall

9.1.6 Combined drainage system

A system that carries both foul and storm water from a property will usually be found on older properties where a Local Authority combined sewage system is the only discharge point.

It may be required to install surface and foul water drains independently, even where a site is being assisted by an existing combined sewer. This needs to be confirmed by the relevant authorities prior to design of the drainage.

It is vital that all surface water fittings have an integral trap so that foul gases do not cause problems when a one-pipe system is installed.

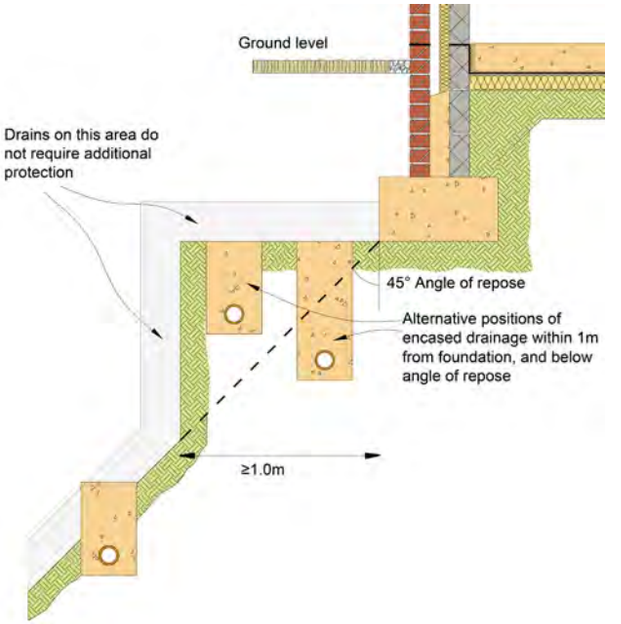

Figure 1: Drainage positions situated within angle of repose and adjacent to foundation by 1m

A combined drain should be capable of accepting peak surface and foul water flows (BS EN 752). It is also good design practice to guarantee that self-cleansing velocity (0.75l/s) is reached when only foul water is entering the drain.

9.1.7 Foul water drainage system

Foul water drainage systems only take foul waste from a property or properties. Foul waste is the waste water from sinks, toilets, showers, baths, dishwashers and washing machines. These systems discharge into Local Authority sewers, then pass through sewage treatment plants. By separating the foul waste and taking it straight through to treatment plants, you are not treating large volumes of storm water needlessly.

9.1.8 Surface water

Surface water drainage is allowable through the use of one of the following systems:

- An adequate soakaway, or some other adequate infiltration system; or where this is not realistic.
- A watercourse; or where this is not realistic.
- A sewer (this helps minimise surface water arriving into the foul water drainage system, which can often overload the capacity of the sewer and cause flooding).

9.1.9 Provision of gutters and downpipes

If the roof area is greater than 6m², it needs to be provided with rain water gutters and rainwater downpipes (RWP) that meet the minimum size requirements shown in Table 2. Thought should also be provided to the provision of rain water drainage to roof areas less than 6m², such as dormer roofs.

Gutters should be laid to a nominal gradient of between 1 mm/m and 3 mm/m where practicable. The gradient of an eaves gutter shall not be so steep that the gutter drops below the level of the roof to such an extent that water discharging from the roof will pass over the front edge of the gutter.

In areas where snow lies on roofs, the front edge of the gutter should not be higher than the projected line of the roof, unless snow guards or other precautions are used.

Discharge of gutters into downpipes can be substantially improved by the careful location of downpipes:

- Locating downpipes at end quarter positions will double the flow capacity if more than one downpipe is required.
- The downpipe should be located within 200mm of the change in direction in order to maintain the flow capacity of the gutter where changes in the line of the gutter occur.

Type of surface area	Effective design area
Paved areas	Plan area
Flat roof plan	Area of roof
30° roof pitch plan	Area x 1.29
45° roof pitch plan	Area x 1.5
60° roof pitch plan	Area x 1.87
70° roof pitch plan	Area x 0.5

Table 1: Calculation of roof area

Max effective roof area (m²)	Gutter size (mm dia)	RWP outlet size (mm dia)	Flow capacity (litres/sec)
6	-	-	-
18	75	50	0.38
37	100	63	0.78
53	115	63	1.11
65	125	75	1.37
103	150	89	2.16

Table 2: Gutter sizes and outlet sizes

9.1.10 Layout of land drains

Drain runs on sloping sites need to be positioned perpendicular to the fall of the site.

Land drains should be positioned adjacent to paths, drives and outbuildings. The pipe soffit should be positioned at least 400mm below the finished ground level, and the backfill consolidated to the same degree of compaction as the adjacent soil.

9.1.11 Soakaways

Soakaways are a simple way of dispersing surface and storm water in circumstances where connection to the storm water sewer system is not feasible or unnecessary. A soakaway is basically a system that loses water rather than collects water. Soakaways are part of the Sustainable Urban Drainage Systems (SuDS) technologies that handle storm water at the source rather than leading it into the public sewer systems.

Developments proposing to use other types of Sustainable Urban Drainage Systems (SuDS) should follow the guidance found in 'SuDS Manual' (a design manual published by CIRIA). The developer should also confirm if the Planning consent for the project imposes any additional requirements which may impact on the design of the sustainable drainage systems (SuDS).

Any surface water drain, soakaway or other infiltration system (including a SuDS system) which is intended to discharge to a water course should have Environment Agency consent to discharge.

- In a location lower than the area being drained.
- At least 5m away from any building (BS 8301).
- Situated so that it will not saturate the foundations of any structure.
- Situated so that the base of any soakaway/ infiltration system is permanently above the water table.

- Situated far enough away from other soakaways/infiltration systems to ensure that the capacity of those other systems and the ground itself is not impaired.
- Situated so that there is no risk of contamination from pollutants.

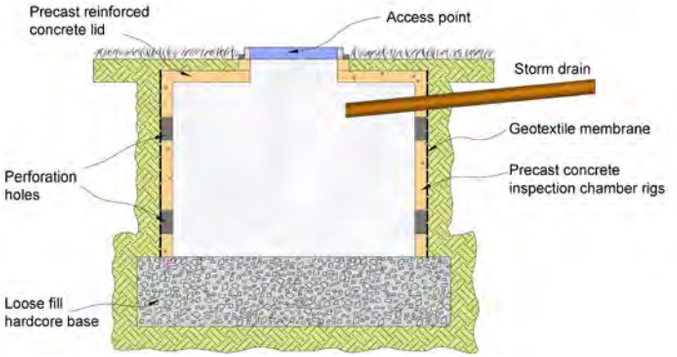

Figure 2: Chamber type soakaway

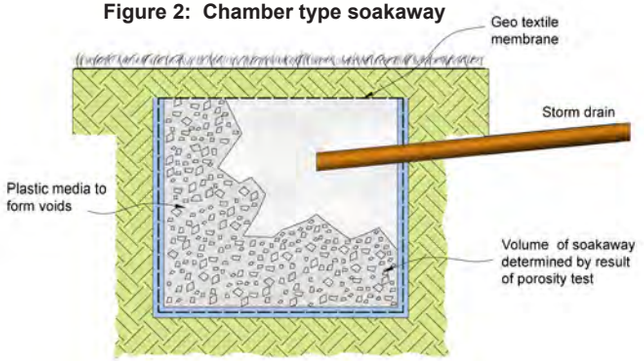

Figure 3: Typical soakaway design

For sites where chalk is prevalent, the CIRIA C574 Engineering in Chalk 2002 publication gives the following recommendations:

Concentrated ingress of water into the chalk can initiate new dissolution features, particularly in low-density chalk, and destabilise the loose backfill of existing ones. For this reason, any soakaways should be sited well away from foundations for structures or roads, as indicated below:

- In areas where dissolution features are known to be prevalent, soakaways should be avoided if at all possible but, if unavoidable, should be sited at least 20m away from any foundations.
- Where the chalk is of low density, or its density is not known, soakaways should be sited at least 10m away from any foundations.
- For drainage systems, flexible jointed pipes should be used wherever possible; particular care should be taken for the avoidance of leaks in both water supply and drainage pipe work.
- As the chalk is a vitally important aquifer, the Environment Agency and Local Authority must be consulted when planning soakaway installations where chalk lies below the site, even where it is mantled with superficial deposits.

9.1.12 Septic tank systems/treatment plants/cesspits

If you are not on main line drainage then you will have a septic tank, treatment plant or cesspit of some description; ordinarily, the foul waste will run to one of the above tanks while the rain water is usually kept separate to help the action of bacteria and enzymes in the tank. The out fall from the septic tank would either run to a soakaway or possibly straight to a river or brook; you will often find the rain water system tapped onto the outlet of a septic tank to help dilute any effluent that may pass through the system.

Any septic tank or other sewerage treatment system that is intended to have an outfall to a water course should have Environment Agency consent to discharge.

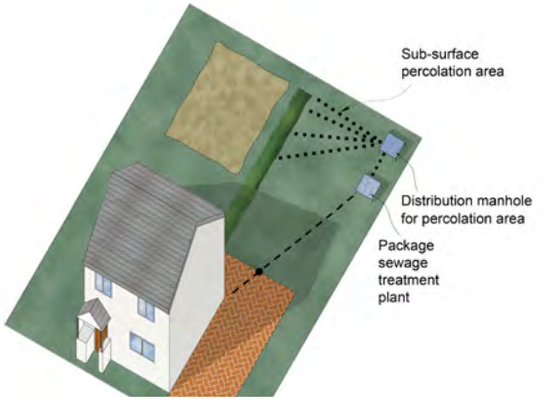

Figure 4: Typical package sewerage plant

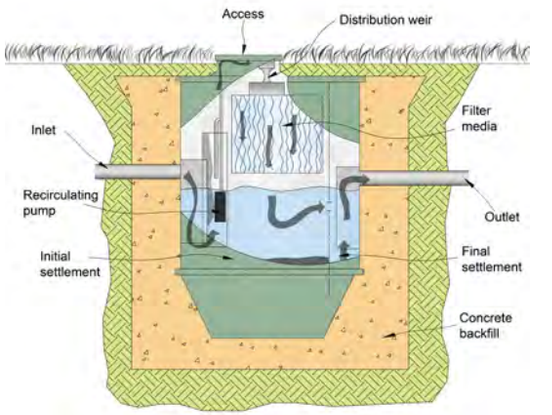

Figure 5: Typical sewage treatment plant

FUNCTIONAL REQUIREMENTS

9.2 DRAINAGE (ABOVE GROUND)

Workmanship

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Materials

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Design

i. The design and specifications shall provide a clear indication of the design intent and demonstrate a satisfactory level of performance.

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Limitations of Functional Requirements

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9.2.1 Above ground drainage

All above ground plumbing systems need to be designed to allow the unobstructed flow of waste water from an appliance to the underground drainage system. To achieve this, the points below should be noted at the design and installation stages:

- Provide rodding access facilities at all changes of direction.
- Avoid bends and changes of direction in the wet part of the above ground drainage system.
- 75mm deep seal traps should always be used, except on a WC or where an appliance on the ground floor discharges directly into a trapped gully.
- Pipe sizes should not exceed the dimensions for diameter against pipe length.
- Pipes should be laid at gradient 1:80 or better.
- Any admittance valve fitted to the system should be located above the highest flood level of any appliance connected to that stack pipe.
- Enclosures to air admittance valves should be adequately ventilated.
- The highest point of a drainage system (head of run) should always be vented to the external air.

9.2.2 Soil and waste systems

In all above ground plumbing systems, the unobstructed flow of waste from an appliance to the underground drainage will be allowed. This will be achieved by following the notes below at the design and installation stages:

- Rodding access is to be provided at all direction changes.
- Pipe and gutter sizes are adequate to take the expected rate of discharge, and are laid at suitable gradients with the minimum of direction changes.
- 75mm deep seal traps should always be used, except on a WC where a 50mm depth of water seal can be used on the above ground drainage system.
- Pipe sizes should not exceed the dimensions for diameter against pipe length.
- Pipes should be laid at a gradient of 1:80 or better.
- Venting to the external air will be required at the highest point of a drainage system (head of run).
- At the head of underground drains, ventilation is to be provided, either by a soil pipe or a separate ventilation pipe.
- A soil or ventilation pipe should extend at least 900mm above an opening if it is less than 3m away from an opening into the building.
- The drains are adequately protected from ground loads

9.2.3 Air admittance valves

Air admittance valves provide a means of ventilation to the drainage system to prevent the loss of water seals in traps.

They are suitable for use in domestic buildings, e.g. bungalows, houses, multi-storey flats, and they only allow air to enter the drainage system. Their use does not avoid the need to ventilate the drainage system adequately.

Where air admittance valves are used to terminate soil pipes they should comply with Building Standards. Valves within the building should be:

- Positioned in areas that are not liable to freezing.
- Positioned in areas with adequate ventilation.
- Accessible for maintenance.

If the discharge stack provides the only ventilation to septic tanks or cesspits, the connecting drain is subject to periodic surcharging or is fitted with intercepting traps, air admittance valves are not suitable for providing ventilation.

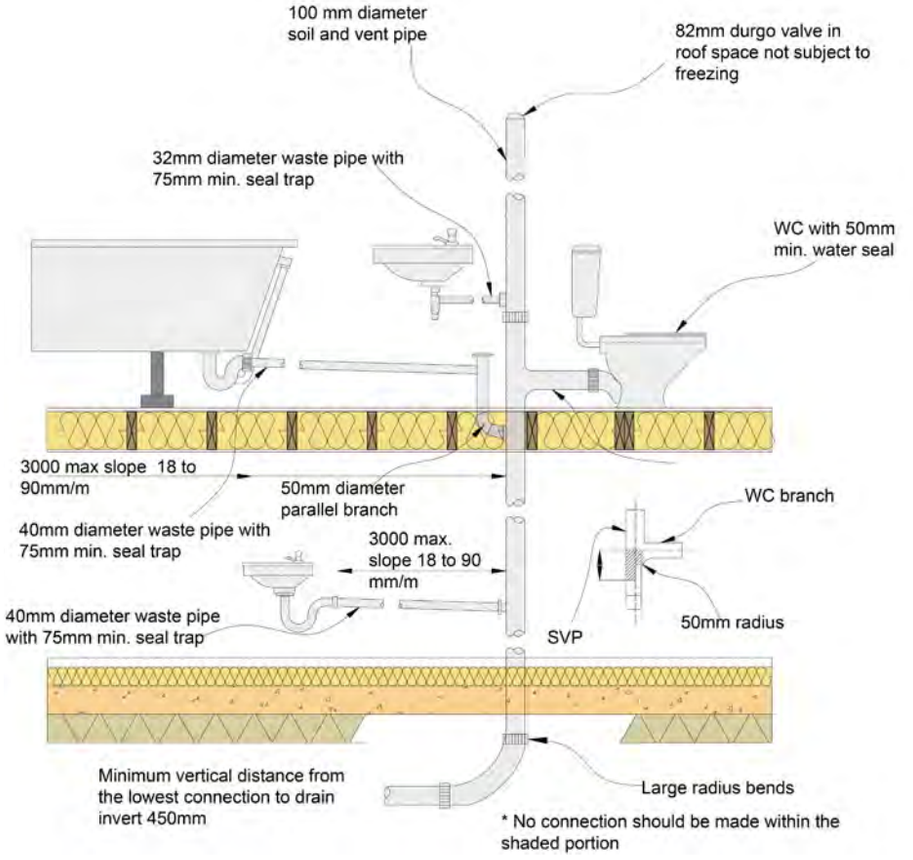

Figure 6: Single stack system: air admittance valves

9.2.4 Provision of information

Design drawings for internal services will need to include:

- Location of sanitary fittings
- Drainage runs
- Location and size of cold water storage cisterns
- Location and size of hot water storage cylinder
- Hot and cold water pipe runs
- Gas supply pipe runs
- Electrical outlets, switches and consumer unit

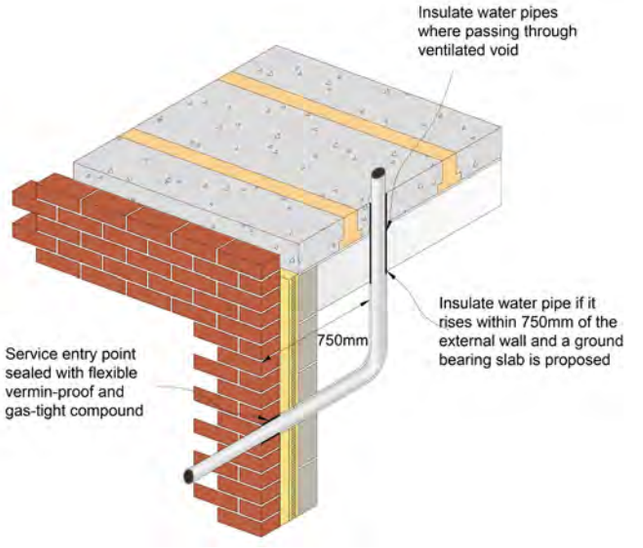

Figure 7: Sealing of service entry points

FUNCTIONAL REQUIREMENTS

9.3 ELECTRICAL INSTALLATIONS

Workmanship

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iii. Certification is required for any work completed by an approved installer.

Materials

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9.3.1 General

A suitable electrical service of the appropriate size for normal domestic use shall be provided.

PVC-covered cables should not be in contact with polystyrene insulation.

Electrical cables should not be diagonal, and their locations should be in accordance with Figure 8.

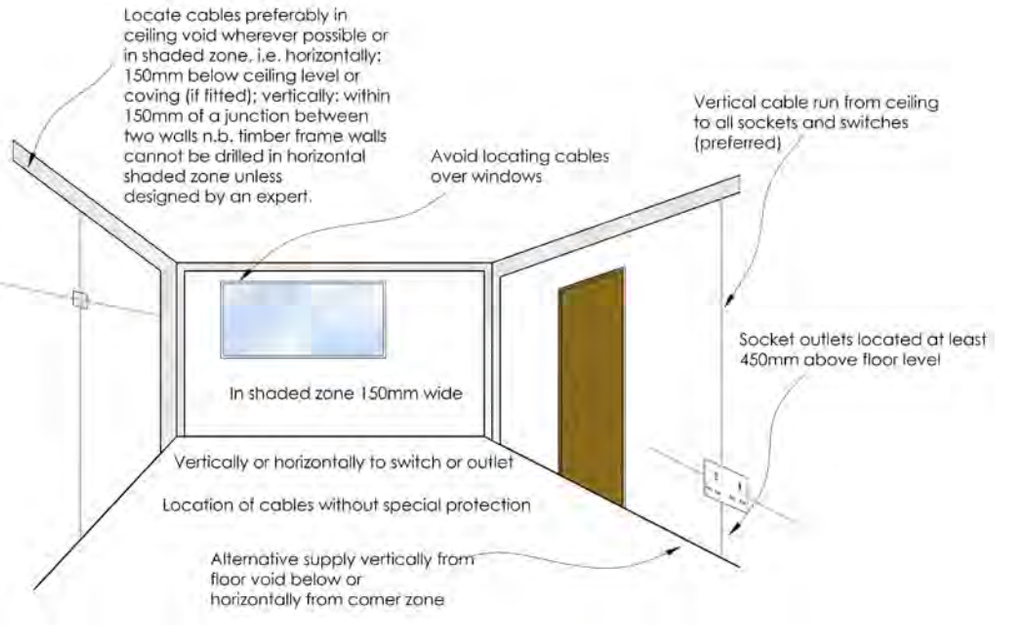


Figure 8: Location of cables without special protection

9.3.2 Supplementary earth bonding

For domestic situations, supplementary bonding is required in areas of increased risk, which are rooms containing a bath or shower. It is not required within kitchens, utility rooms or washrooms.

Supplementary bonding is not required to the pipes or metal fitments attached where plastic pipes are used within a bathroom or shower room.

This also applies where short lengths of metal pipes connected to bathroom fittings are attached to plastic pipes.

Supplementary bonding is still required to electrical equipment such as electric showers or electric heaters. This type of bonding must also be connected to the protective conductor of all circuits supplying electrical equipment in the bathroom.

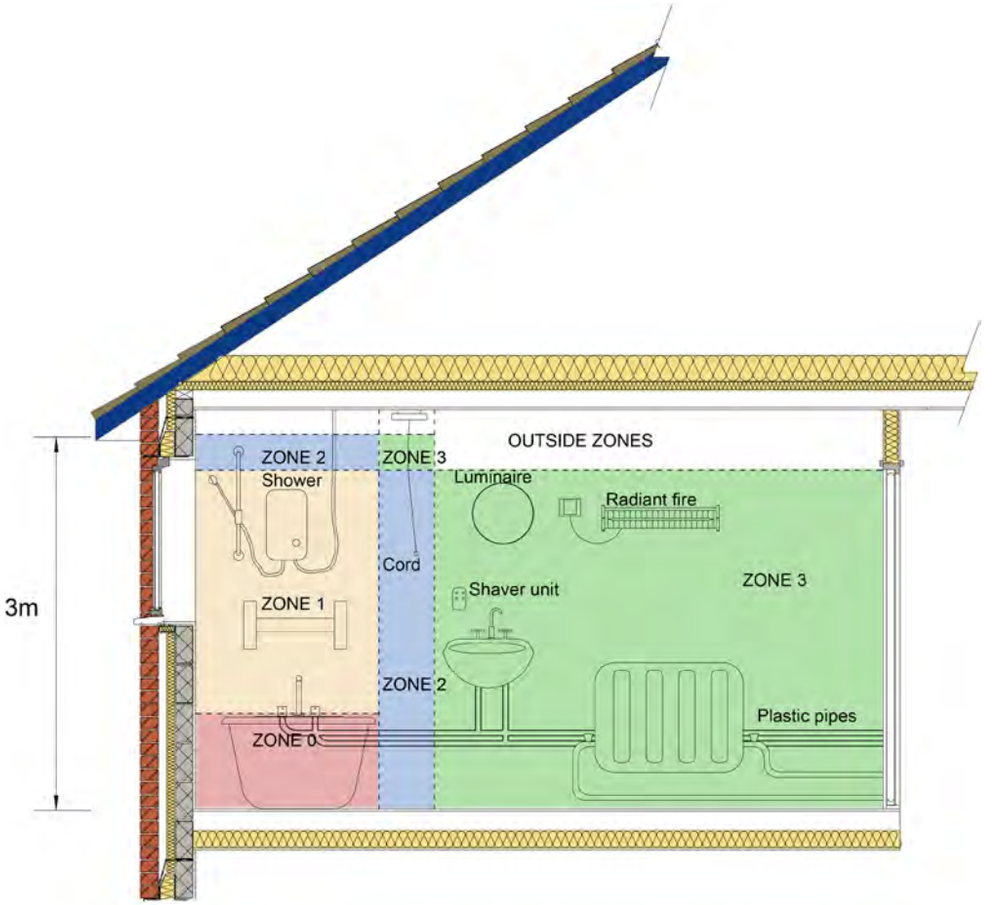
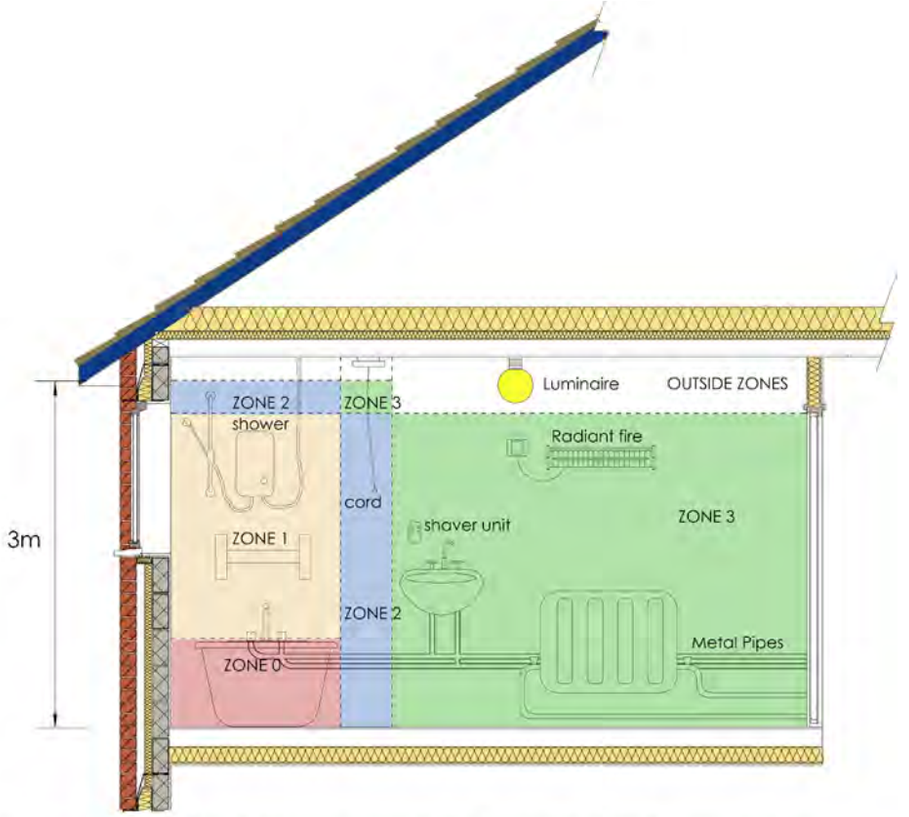


Figure 9: Supplementary bonding in a bathroom, plastic pipe installation



The protective conductors of all power and metal lighting points within the zones must be supplementary bonded to all extraneous conductive parts in the zones including metal waste, water and central heating pipes, metal baths and shower basins.

Circuit protective conductors may be used as supplementary bonding conductors.

Metal baths not connected to a metal building structure do not require supplementary bonding if all metal pipes connected to them have been bonded.

Connection to pipes to be made with BS 951 clamps (complete with "Safety Electrical Connection" label).

Figure 10: Supplementary bonding in bathroom, metal pipes

9.3.3 Socket outlets

Socket outlets are to be conveniently positioned in close proximity to the TV aerial and telephone outlets, thus allowing for electrical equipment including TVs and DVD players. Rooms should be provided with the following 13a outlets:

- Kitchen/Utility – 8 outlets
- Dining Room – 4 outlets
- Living or Family room – 8 outlets
- Bedroom (main) – 6 outlets
- Bedroom (other) – 4 outlets
- Landing – 2 outlets
- Hall – 2 outlets

9.3.4 Cooking

Cooking appliances provided to the cooker space in a dwelling must be suitably switched and terminated with a minimum 30a electricity supply.

If a cooker panel is provided, it needs to be positioned to the side of the cooker space. A 13a socket outlet should be positioned at the cooker space where a gas supply is provided to the dwelling.

9.3.5 Light fittings

At least one fixed lighting outlet should be provided to all rooms. Areas greater than 25m^2 are to be provided with two fixed lighting outlets.

Halls, landings and staircases are to be provided with lighting outlets and two-way switches.

Down lighters and other flush-fitting attachments should not be installed through a ceiling if the ceiling is providing part of the required acoustic insulation or fire resistance to the property.

If down lighters are provided to ceilings below roof voids (excluding thatched roofs), precautions are to be taken to ensure that no fire risk is caused by the proximity of other materials.

Passive infrared (PIR) sensors are to be used in common and external areas.

9.3.6 Positioning of sockets and switches

Sockets and switches should be positioned in accordance with figure 11.

Consumer units should be between 1350mm and 1450mm above floor level.

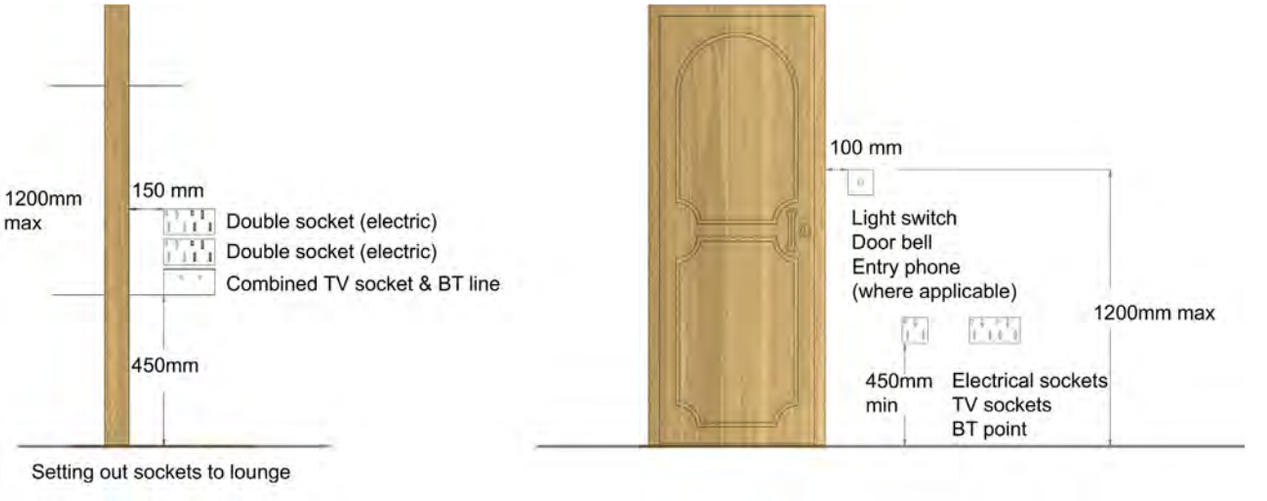


Figure 11: Heights of wiring accessories

FUNCTIONAL REQUIREMENTS

9.4 HEATING AND MECHANICAL SERVICES

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9.4.1 Gas service

Where provided, the gas service shall be of a suitable scale for normal domestic usage.

A meter control valve is to be fitted on the supply side of the meter.

External meter boxes should be of a type approved by the supply authority and located as close as practical to the main access point to the dwelling.

Domestic meters may be of the following type:

- Built-in to the outer leaf of the wall.
- Surface-mounted on an external wall.
- Semi-concealed: sunk into the ground adjacent to the outer wall.
- Individual, purpose-made compartments, in accordance with British Standards.

All water services are to have precautions against a possible chemical attack.

Corrosion-resistant materials should be used for pipes and fittings for water services. The recommendations of the water supplier should be adhered to.

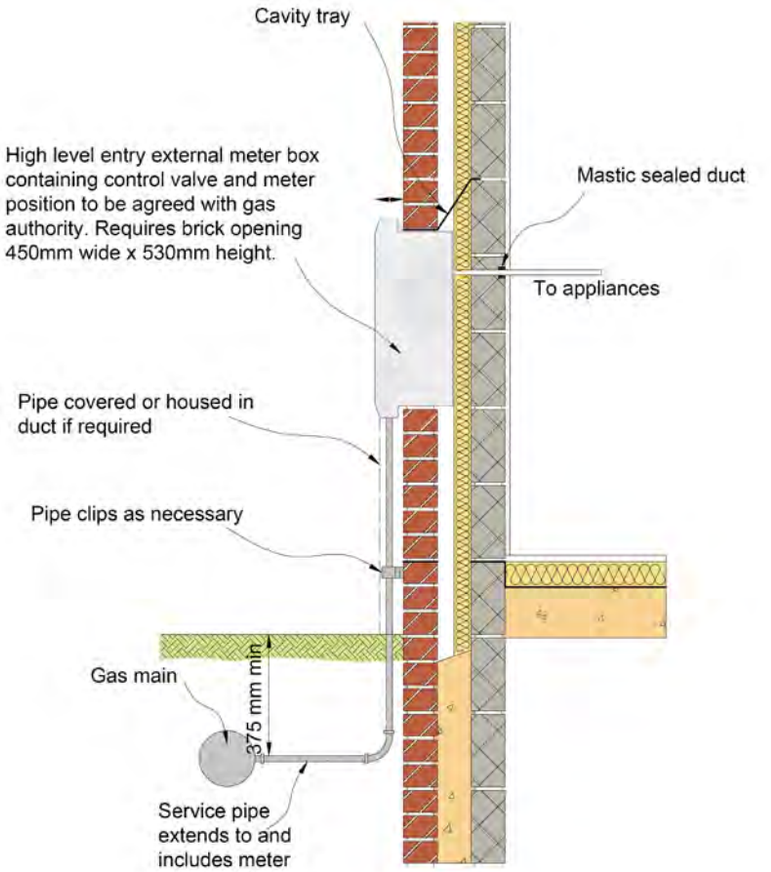

Figure 12: Gas service pipes

9.4.2 Cold water services

Each dwelling should have an adequate supply of cold water. The water supply should be fed from below ground and insulated in accordance with Figure 13 to prevent freezing. Cold water systems may have provision for storage or be directly connected to the main supply.

Drinking water needs to be supplied directly from the main supply.

Cold water pipes and storage cisterns located in roof spaces and other unheated areas should be appropriately insulated to the relevant standards.

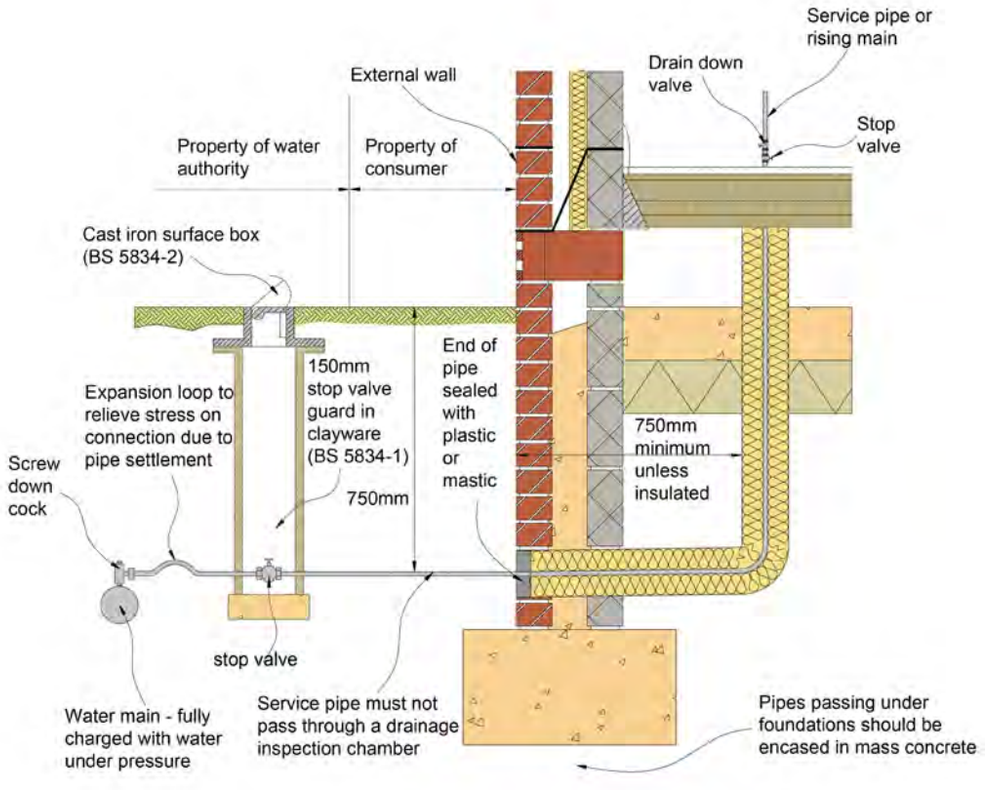

Figure 13: Insulation of incoming services

Cold water storage cisterns will require the capacity specified in the design. Suitable support should be given for the cistern filled with water.

To stop the cistern bottom being deformed, permanent support is to be given where necessary. Adequate materials for support platforms are:

- Softwood boarding
- Marine Plywood
- Chipboard Type P5
- Oriented Strand Board Type OSB3 to British Standards

All water tanks should be accessible. Gangway boarding is required to each cistern opening from the roof space access. An area of 1m2 of boarding is to be provided next to cisterns to permit routine maintenance.

Water storage cisterns should be protected from contamination by a rigid, close-fitting cover (which is not air tight) that excludes light and insects.

Holes should be formed with a cutter in the positions shown in the design.

Overflows in warning pipes should be no less than 19mm diameter and situated 25mm from the shut off water level in the cistern. The pipe may dip below the water level in accordance with water regulations. Alternatively, the pipe should terminate vertically downwards, or a tee should be fitted horizontally at the discharge end.

9.4.3 Hot water services

Hot water systems may have provision for storage or may be of the instantaneous type, e.g. combi boilers.

Vertical installation of cylinders is required with access, and cylinders are to be insulated as specified in the design.

Where an immersion heater is fitted, it should be:

- Appropriate for the type of water supplied to the dwelling
- Thermostatically controlled
- Located so that it can be withdrawn for replacement
- Fitted with an on/off switch

Cisterns, vent pipes and all water services in unheated spaces should be insulated against freezing as specified in the design. Insulation is not to be placed below a cold waste tank where it can benefit from heat from beneath. Tanks that are raised need to be insulated on all sides in an unheated roof space.

Fully insulated bends and junctions are required, especially near openings to the outside air, such as the eaves. If possible, water pipes should not be located within a loft space where they could be affected by cold ventilation air.

9.4.3.1 Provision for expansion

An expansion pipe is to be provided on vented systems for hot water.

9.4.3.2 Unvented hot water systems

Third-party accreditation is required where an unvented hot water system with a storage capacity greater than 15 litres is required by the design. Installation is to be completed by a competent person.

9.4.3.3 Draining down facility

Hot and cold water installations require the capability to be drained down.

9.4.4 Use of materials

Materials that are safe and minimise the risk of corrosion are to be used for pipes and fittings for water services. The recommendations of the water supplier with regard to materials and fittings should be followed.

It may be necessary to fit aluminium protector rods in areas where the corrosion of copper cylinders occurs. These are to be fitted during manufacture, in accordance with the relevant British Standards.

9.4.5 Space heating

Any whole-house heating system should be designed to meet internal temperatures to the levels set out as per below. External temperature is to be -3°C.

Location	Temperature	Air changes
Living room	21°C	1 per hour
Dining room	21°C	1 per hour
Kitchen	18°C	2 per hour
Bedrooms	18°C	1 per hour
Bed-sitting room	21°C	1 per hour
Bathrooms	22°C	2 per hour
Hall and landing	16°C	2 per hour
Separate WC	18°C	2 per hour

Table 3: Whole house heating system: temperatures

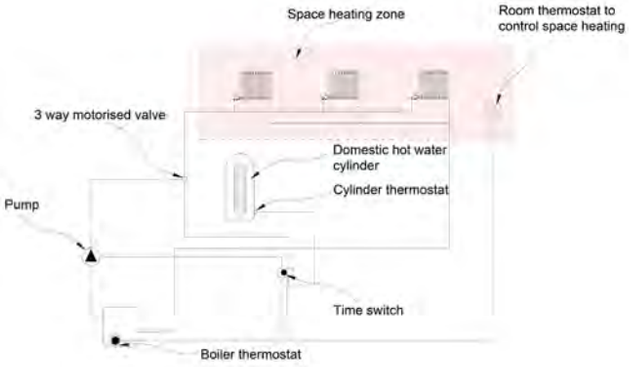

Figure 14: Controls for combined space heating and domestic hot water

Controls for wet heating systems are to be provided as follows:

- A room thermostat controlling the heater unit.
- A time switch allowing at least two heating periods a day. In the case of electrically heated storage systems (Electricaire), there will normally be a further time switch to control the electrical 'charging' periods to conform within the chosen tariff.
- A programmer to select:
  - Hot water
  - Space heating
  - Hot water and space heating

A thermostat sensitive to the room air temperature should be provided for independent heaters.

The boilers chosen for each dwelling should be based on their efficiency within the PCDF list. The efficiency of the boiler should be no less than indicated in the table below.

Central heating system fuel	PCDF% (2009)
Mains natural gas	88
LPG	88
Oil	88

Table 4: Minimum efficiencies of heating systems

9.4.6 Ventilation

Room	Intermittent extract	Continuous extract
Kitchen	30 l/s adjacent to hob Or 60 l/s elsewhere	13 l/s
Utility (access via dwelling)	30 l/s	8 l/s
Bath / shower room	15 l/s	8 l/s
Sanitary accommodation	6 l/s	6 l/s

Table 5: Extract ventilation rates

9.4.7 Extractor fans

Where ductwork from extractor fans goes through unheated spaces such as roof voids, action should be taken to minimise the chance of condensation forming in the ducting and any consequential damage caused to finishes and the fan unit.

- Ensure ducting discharges to the outside air.
- Provide insulation to the outside of the ductwork, and lay to a fall away from the fan.

The system should provide extraction rates in accordance with Building Regulation requirements Approved Document F.

All habitable and service rooms within dwellings should have some form of ventilation as a requirement. It may be permanent background ventilation, mechanical ventilation or an opening window.

9.4.8 Extract ducts

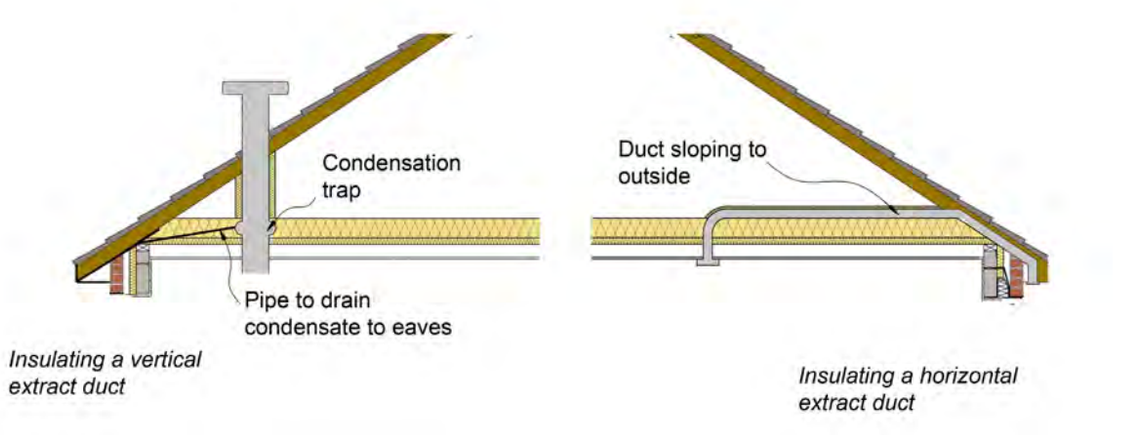

Figure 15: Extract ducts

Adequate support is required for extract ducts, and they also need to have sealed joints where required. Insulation needs to be provided where ducts pass through unheated spaces, such as roof voids, to the outside air, or a condensation drain should be provided in accordance with the design.

Where ducting is part of a mechanical ventilation and heat recovery system, it should be insulated in accordance with the manufacturer's recommendations.

Where a gas appliance requires an electrical supply, a suitably fixed spur or socket outlet should be provided.

A concealed co-axial cable should be provided from the roof void to a terminal outlet within the main living room. Where the co-axial cable is not provided, a conduit and draw wire, or an alternative, should be provided. The provision of an aerial is not required.

9.4.9 Whole-building ventilation

The whole-building ventilation rate for the supply of air to the habitable rooms in a dwelling should be no less than the rates stated in Table 6 below.

Ventilation	Number of bedrooms in dwelling				
	1	2	3	4	5
Whole building ventilation rates (l/s)	13	17	21	25	29

Table 6: Whole-building ventilation rates

9.4.10 Passive stack ventilation (PSV)

The system is to meet the relevant third-party accreditation.

The PSV layout should be designed to:

- Avoid cross flow between the kitchen and bathroom/WCs.
- Prevent, as far as possible, air flow in the ducts being adversely affected by the prevailing wind speed and direction, or by sudden changes in these.
- Minimise resistance to air flow by having ducts that are as near to vertical as possible.

To ensure good transfer of air throughout the dwelling, there should be an undercut of minimum area 7600mm^2 in all internal doors above the floor finish (equivalent to an undercut of 10mm for a standard 760mm wide door).

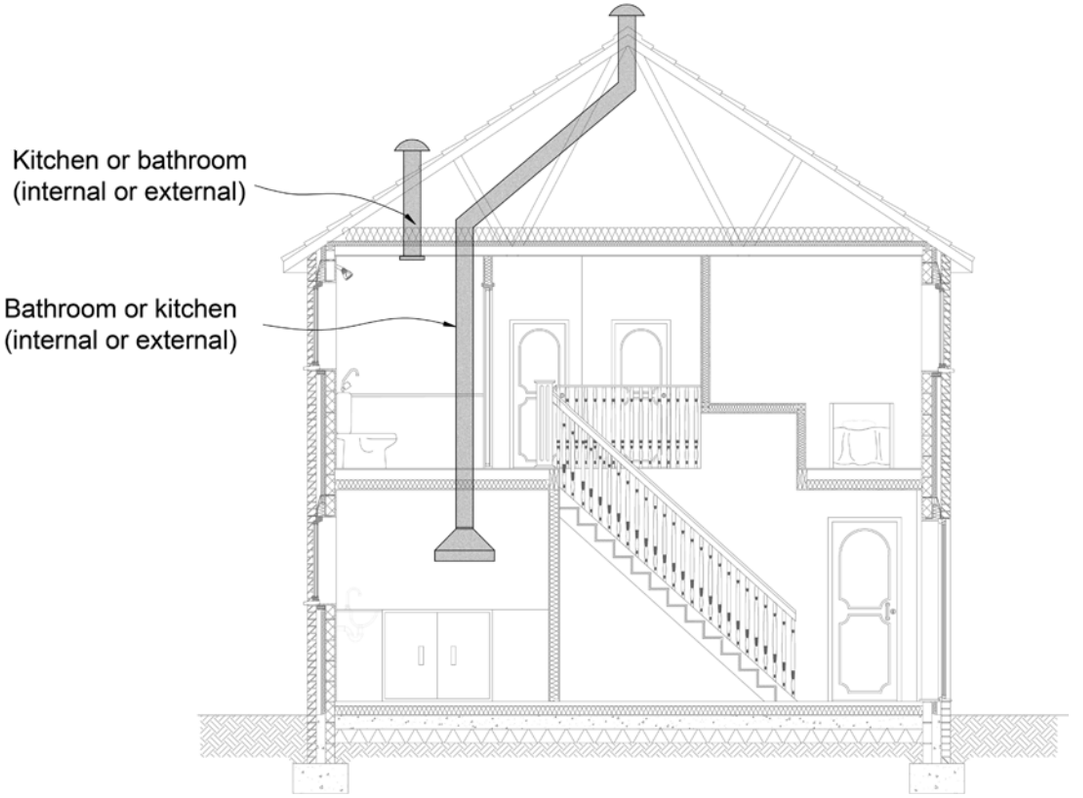

Figure 16: Passive stack ventilation

9.4.11 Installation of building services

All items should be installed to ensure satisfactory operation.

Items to be taken into account include:

- Locations and fittings of pipes and cable service entries through the substructure.
- Services must be sleeved or ducted through structural elements (and not solidly embedded) to prevent damage. Fire stopping may also be required.Services should not to be located in the cavity of an external wall, except for electricity meter tails.
- Only to be buried in screeds where permitted by relevant Codes of Practice.

Where copper pipes are permitted in floor screeds, they should be:

- Sleeved or wrapped so that they can move freely along the length and at joints and bends.
- Jointed with capillary joints.

A metallic tape should be applied to the pipework where plastic pipework is hidden within or behind wall surfaces, which would otherwise not be located by a metal detector.

9.4.12 Jointing of pipes and fittings

Proprietary joints should be made strictly in accordance with the manufacturer's instructions.

Only fluxes recommended by the Pipe Manufacturer should be used, and all traces should be removed immediately after jointing. Fluxes containing lead are not acceptable.

Suitable clips or brackets are to be used to secure. Fixings should be installed adequately, and spaced to stop sagging but not restrict thermal movement. Where needed, pipes should have adequate falls.

Sufficient room should be allowed for thermal expansion and contraction to avoid damage and noise from pipe movement.

Holes should be at least three times their diameter apart.

9.4.13 Notches and drillings

Floor joists should not be excessively notched or drilled. Further guidance can be found in chapter 8 of this manual.

9.4.14 Concealed services

If the services are hidden in walls or floors, they need to be positioned so that any significant cracking of the surface cannot occur.

9.4.15 Wall chasing

If chases in walls are necessary, their depth should not exceed:

- One-sixth the thickness of the single leaf for horizontal chases.
- One-third the thickness for vertical chases.

Hollow blocks should not be chased unless specifically permitted by the manufacturer.

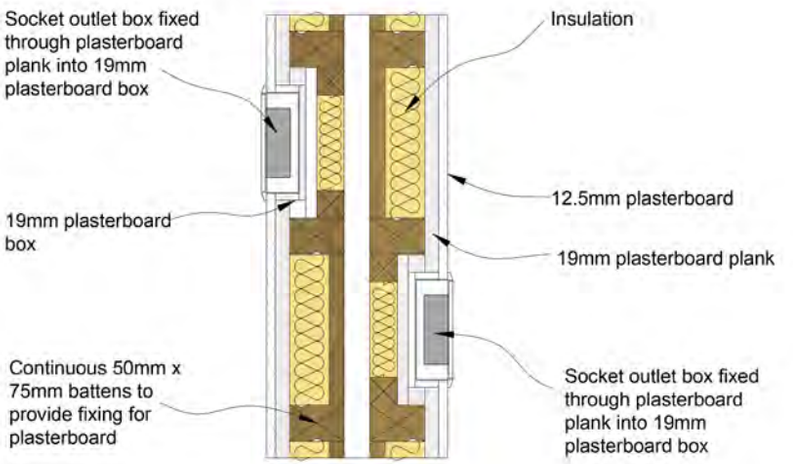

Figure 17: Staggered services on party walls

9.4.16 Services within or beneath floors

Protection through wrapping or ducting is necessary when pipes are situated under floor screeds. Thermal expansion allowances are to be made, especially at changes of direction.

The insulating material around the pipework needs to be a minimum of 25mm in thickness. The screed thickness should still be at least 25mm where pipes cross over.

9.4.17 Fire-stopping

Fire stopping is required around services that penetrate fire-resisting floors, walls or partitions. If proprietary systems are used, they should be installed using the manufacturer's recommendations.

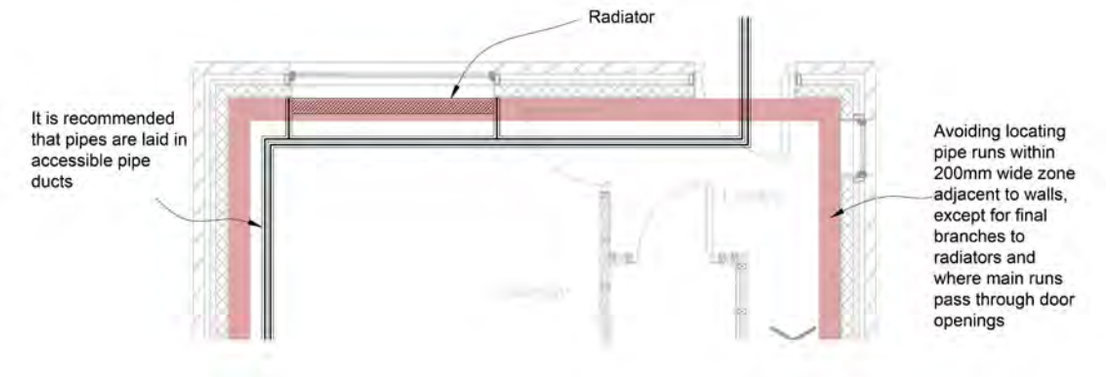

Figure 18: Recommended positioning of pipes in screeds