5.

Drainage

Contents

5.1 Drainage: Above Ground Drainage

Introduction

This section provides guidance on meeting the performance requirements for above ground foul and surface water drainage systems.

5.1.1 Compliance

Above ground drainage systems shall meet the performance requirements of this section.

5.1.2 Information to be provided

The Designer shall provide sufficient design details to demonstrate it meets the requirements of this section.

A full set of design drawings and specifications should be made available to the Warranty provider and all other interested parties prior to the associated works starting on site. This may include:

1. Proposed drainage layouts including invert levels, gradients, pipe diameters, location of inspection chambers and rodding points.
2. Position of ventilation to the foul drain.
3. Specification of drainage pipes and supports.
4. Location and size of cold water storage cisterns and hot water storage cylinders.
5. Hot and cold water pipe runs.
6. Areas of roof drained to each gutter.
7. Downpipe and/or drainage hopper positions from roof.
8. Positions of hazards e.g. Flues, opening windows/doors.
9. Location of below ground surface water/storm drainage connections.
10. Rodding access provision.
11. Downpipe outlet positions - avoiding potential water ingress/splashing of external walls etc.

The Warranty surveyor, at their discretion, may also request supporting information that demonstrates suitability for use of any materials or systems contained within the above.

5.1.3 Material specification

Materials and components shall:

- Be durable.
- Be fit for purpose.
- Be installed in accordance with the manufacturer's recommendations.
- Be constructed using non-hazardous materials.
- Satisfy the requirements of the relevant Building Regulations.
- Be suitable for exposure to sunlight without early degradation where materials are used externally.

Foul drainage

The materials and components used for sanitary pipework, e.g. pipes, fittings and fixing accessories, should be proven to be suitable for their intended purpose and comply with BS EN 12056 parts 1, 2 and 5. For further guidance on suitability of products, please refer to 'Appendix C'.

Surface water drainage

The materials and components used for rainwater drainage systems should be proven to be suitable for their intended purpose and comply with BS EN 12056 part 3. For further guidance on suitability of products, please refer to 'Appendix C'.

Coastal locations

Where developments fall under the Warranty definition of a coastal location (see 'Appendix B'), the requirements of 'Appendix B' should also be satisfied.

5.1.4 Design and layout

All above ground drainage systems shall:

- Be designed to allow the unobstructed flow of waste water and surface water to an underground drainage system. The drainage system shall be adequately accessible for inspection and cleaning.
- Prevent the entry of hazardous ground substances, external moisture or vermin into the building.
- Not adversely affect the structural stability of the building.
- Be installed in accordance with manufacturer's recommendations and the design requirements.
- Meet the requirements of the Building Regulations.

Foul drainage

The overall design of the drainage system should be in accordance with BS EN 12056. The above ground drainage should be connected to a suitable underground drainage system. In addition, the following should be satisfied:

- Provide rodding access facilities at all changes of direction.
- Avoid bends, connections and changes of direction in the wet part of the above ground drainage system.
- Pipe sizes should be adequate to take the expected rate of discharge and load at suitable gradients with the minimum of direction changes.
- Pipe sizes should not exceed the dimensions for diameter against pipe length.
- Pipes should be laid at gradient 1:80 or better and adequately supported to prevent sagging and back falls.
- Minimum trap sizes and seal depths should be in accordance with the Building Regulations.
- Sanitary pipework must be adequately supported (see table 1).
- Provision for expansion in the pipework must be given both in vertical pipes and branch/waste pipes (see table 2).
- The highest point of a drainage system (head of run) should always be vented to the external air.
- 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 should be adequately protected from ground loads and movement in the building structure.
- Drains and pipes passing through the external waterproof envelope of the building or through the underground walls must be suitably sealed to prevent vermin ingress and dampness.
- Sound insulation will be necessary where soil pipes pass through rooms, to the underground connection. This can be achieved by:
  - Encasing the pipework within a boxed in framework with a minimum 15kg/m^2 board covering, **or**
  - Wrapping the pipework with mineral wool fibre at least 25mm thick, throughout the height of the pipe - up to the highest ceiling level.

Table 1: Maximum distance between sanitary pipe supports

Pipe material	Normal pipe size	Vertical pipes	Low gradient pipes
Plastics (any type)	32mm to 40mm	1.2m	0.5m
	50mm	1.2m	0.6m
	75mm to 100mm	1.8m	0.9m
	150mm	1.8m	1.2m
Cast iron	All sizes	3.0m	3.0m
Copper	25mm	2.4m	1.8m
	32mm to 40mm	3.0m	2.4m
	50mm	3.0m	2.7m
	65mm to 100mm	3.7m	3.0m
Galvanised steel	25mm	3.0m	2.4m
	32mm	3.0m	2.7m
	40mm to 50mm	3.7m	3.0m
	65mm to 75mm	4.6m	3.7m
	100mm	4.6m	4.0m

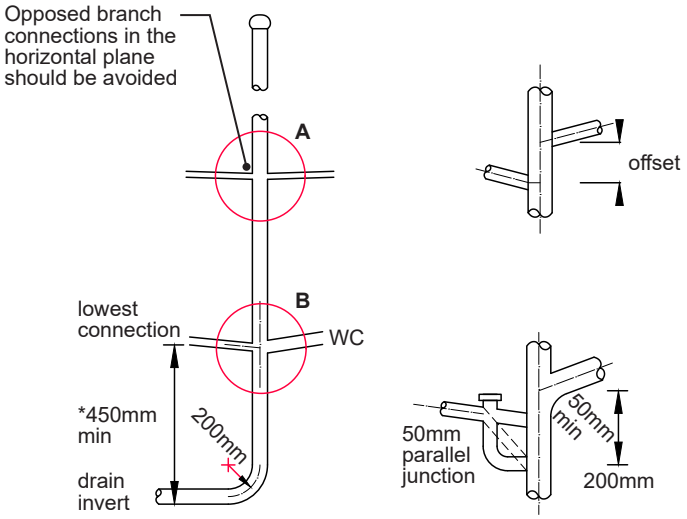
Table 2: Design for thermal movement in runs of waste pipes

Fitting type	Movement provision
Push fit	Push fit joints should be assembled with clearance for expansion. Check expected movement and relate to number of joints.
Solvent-welded joints	Provide 'push-fit' couplings at calculated intervals, but not exceeding 1.8m.

Notes:
1. The manufacturer's recommendations should be followed in respect of provision of movement (Polypropylene pipe work can expand more than UPVC pipework for the same length).
2. Ensure 'push-fit' joints are lubricated before assembly with specified lubricant that is approved for the pipe type.
3. Sleeve wastes through walls to permit pipe movement.

Position of connections to soil stacks

A branch creates a no connection zone on a stack. 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.



Key

A - Opposed connections without swept entries not exceeding 65mm should be offset:

- 10mm on a 100mm stack.
- 250mm on a 150mm diameter stack.

Opposed connections larger than 65mm (without swept entries) should be offset at least 200mm irrespective of stack diameter. Unopposed connections may be at any position.

B - Angled connection or 50mm diameter parallel junction where a branch discharge pipe would enter the WC no connection zone.

Note: A waste (branch discharge pipe) manifold may be a suitable alternative.

*this should be increased in buildings over 3 stories.

Openings for pipes in fire resisting floors and walls

Pipes which pass internally through fire resisting floors and walls (unless in a protected shaft) must not compromise the required fire resistance of the element through which they pass. As a minimum, openings through floors and walls should be as few as possible in number, as small as practicable in size and fire-stopped to the surrounding construction.

The relevant Building Regulations should be consulted with for guidance on pipes passing through compartment walls and floors.

Air admittance valve

Where air admittance valves are used to terminate soil pipes, they should comply with BS EN 12380 and have a current third party product conformity certificate and be used within the scope of that approval certificate.

Valves within the building should be:

- Positioned in areas with adequate ventilation. Where the pipes and valve are boxed in, adequate means of ventilation will be required by means of grilles or gaps. The amount of ventilation provided should be at least 2500mm² or whatever specified by the manufacturer.
- Positioned in areas that are not liable to freezing.
- Located above the highest flood level of any appliance connected to that stack pipe.
- 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 in these circumstances.

Sanitary fittings

Wash basins (WHB), baths, bidets, shower trays:

- Should be securely fixed with appropriate non rusting fixings.
- Floors should be capable of carrying the weight of the appliance.
- Excessive packing must be avoided.
- Must be connected to the drainage system and where applicable an appropriate water supply.

Where WC's, WHB's, baths and shower units are installed; where tiling is installed around these appliances, flexible waterproof mould resisting flexible sealant should be used to accommodate any movement between the appliance and tiles.

Baths and shower units should be correctly supported so that when in use the fittings will not deflect excessively and pull on the mastic seal.

Floor joists should be doubled up under the bath locations. Where heavier baths (e.g. cast iron baths or similar) are proposed, the floor joists must be designed to take the additional loadings and joist feet located over the joists.

Macerators and pumps

When installing macerators and such pumps to above ground drainage the following must be considered:

- The electrical installation must be carried out by a qualified person.
- The system must be installed in accordance with the manufacturer's guidance.
- The system should be flushed through several times after installation and prior to first use.
- The client will need to be provided with details of appropriate maintenance, servicing and cleaning for the system on completion of the installation.

Surface water drainage

The overall design of the drainage system should be in accordance with BS EN 12056-3. The exception would be where we require a higher standard. The above ground drainage should be connected to a suitable underground drainage system.

Calculation of roof area and, gutter and outlet sizes

The effective design area of a drained roof / balcony area should be determined using Table 3. If the roof area is greater than 6m², a roof will need to be provided with rainwater gutters and rainwater downpipes (RWP) that meet the minimum size requirements shown in Table 4.

Where a roof area is less than 6m², thought should also be provided to the provision of rainwater drainage of such roof areas e.g. dormer roofs so as to ensure rainwater will be effectively disposed and not cause potential for damage and resulting water ingress into the building.

Note: Roof areas e.g. flat roofs, which are less than 6m² will still require to be laid to a fall.

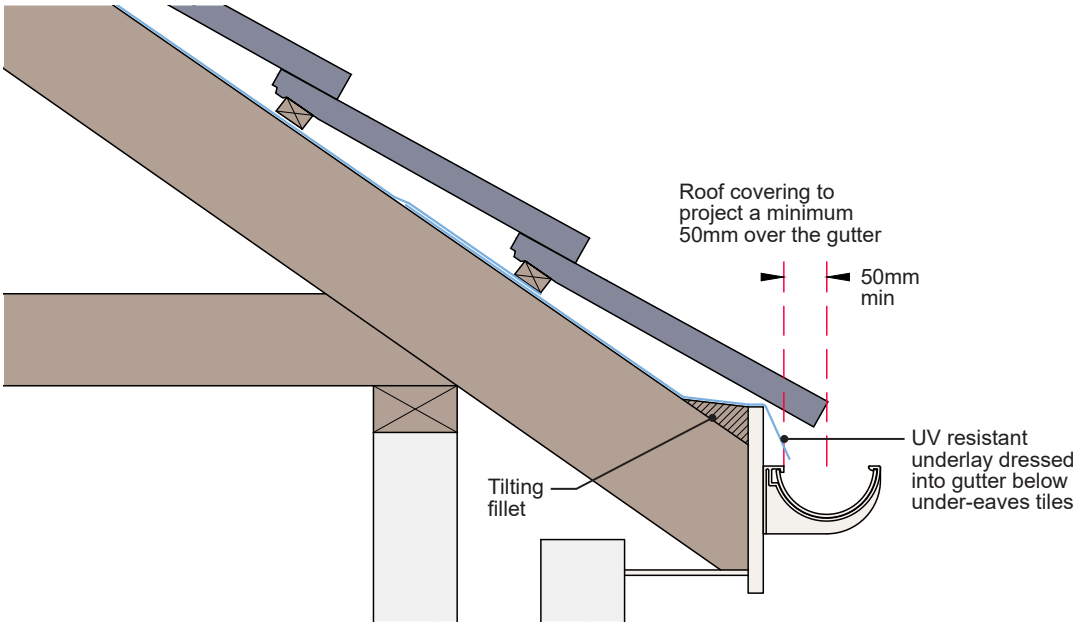
Table 3: Calculation of roof area	
Type of surface area	**Effective design area**
Balcony areas	Plan area
Flat roof plan	Area of roof
30° roof pitch plan	Area x 1.29
45° roof pitch plan	Area x 1.5
60° roof pitch plan	Area x 1.87
Pitched roof over 70° or any wall	Elevational area x 0.5

Table 4: Gutter sizes and outlet sizes			
Max effective roof area	**Gutter size (diameter)**	**RWP outlet size (diameter)**	**Flow capacity**
6m²	-	-	-
18m²	75mm	50mm	0.38 litres/sec
37m²	100mm	63mm	0.78 litres/sec
53m²	115mm	63mm	1.11 litres/sec
65m²	125mm	75mm	1.37 litres/sec
103m²	150mm	89mm	2.16 litres/sec

Gutters

- Gutters should be laid to a nominal gradient of between 1mm over 1m and 3mm over 1m 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.
- Gutters should be fixed with the centre line vertically below the edge of the roof covering. Pitched roof UV resistant underlay should dress over the gutter.
- Gutters must be adequately supported and not sag. Fascia or rafter brackets should be typically no more than 1m apart or as recommended by the manufacturer.
- Additional support for gutters will be required at angles, corners, and outlet positions.
- Gutters should be laid so that any overflow in excess of the design capacity - caused by extreme conditions such as above normal rainfall, will be discharged clear of the building. On flat roofs, balconies, valley gutters and parapet gutters, additional outlets may be necessary.
- 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.
- Gutters should have stop ends fitted.
- Gutters should be designed to deal with concentrated loads e.g. from nearby downpipes discharging water from higher level roof areas such as dormers.

Tile edge over gutter centre line



Downpipes

- 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.
- Downpipes must be installed plumb and supported at regular centres throughout the height of the pipework.

Other considerations

- Ensure that joints in gutters, gutter outlets and downpipes are sealed in accordance with the manufacturer's recommendations.
- Gutters and downpipes must be installed to allow for thermal movement. Joint gaps must be to the manufacturers recommendations.
- Outlets should be correctly positioned relative to gullies.
- Where a rainwater downpipe discharges into a gully, it should terminate below the gully grating but above the water seal, preferably by the use of a back inlet.
- Sanitary pipework must not be connected/discharge into the surface water/storm drainage system.
- Pipework shall not reduce in diameter in the direction of flow, except in the case of siphonic systems.
- Siphonic roof drainage systems should be designed in accordance with BS EN 12056-3.
- Rainwater pipes from higher roof levels should not discharge onto a lower flat roof or balcony.

Additional requirements for flat roofs and balconies

(Please also refer to the 'Roofs - Flat Roofs' and 'Roof Terraces and Balconies' section)

- To ensure effective drainage of the 'roof area', balcony decking or other finish laid over the waterproof roof covering must not restrict water flow to the rainwater outlets e.g. decking supports must not be laid across the fall of the roof.
- Flat roofs and balconies must be designed and constructed to have a finished fall (allowing for deflection in the construction) of no less than 1:80.
- The roof area should fall away from a wall that contains any door/window opening and a minimum upstand of 150mm provided between the waterproof decking and the underside of the opening.
- Tapered insulation and 'crickets' must only be designed and manufactured by the insulation manufacturer (not cut to fall on site).

Rainwater outlets must be:

- Recessed and not stand proud above the flat roof water proof covering; to ensure water will flow freely into the outlet.
- Be accessible for maintenance (any decking above the outlet must easily be removable).
- Sized and be of sufficient numbers and position to deal with the local rainfall intensity in accordance with BS EN 12056-3.
- There must be 2 outlets (or one outlet plus one overflow) where the flat roof/balcony has an upstand to all sides.
- Drainage from roof gardens should enable inspection and access to the outlet and shall incorporate means of excluding soil and debris from entering the roof drainage system.
- Drainage outlets, formed through parapet walls, must be constructed with secondary protection to prevent water ingress into the wall structure.
- Drainage outlets, formed through parapet walls in timber framed construction where the outer leaf is masonry, must allow for shrinkage in the timber frame i.e. the frame will settle but the outer leaf will not, therefore a backfall could result in the outlet.