

**Plumbing:
Sanitary Drainage –
Fundamentals and
common enquiries
for graded drainage
systems**



The VBA respectfully acknowledges the Traditional Owners and custodians of the land and water upon which we rely. We pay our respects to their Elders past and present.

We recognise and value the ongoing contribution of Aboriginal people and communities to Victorian life.

We embrace the spirit of reconciliation, working towards equality of outcomes and an equal voice.

Welcome

Today you will hear from:



Neville Campbell

Senior Technical Adviser (Plumbing)
Technical and Regulation

**Practitioner
Education
Series**



The Victorian Building Authority (VBA) works to ensure the **safety, quality and compliance of building and plumbing work in Victoria** by regulating practitioners under the Building Act 1993.

Our focus is on:

- **enhancing practitioner capability and conduct;**
- **ensuring compliance with standards and**
- **protecting consumer interests.**

Through **education, oversight and enforcement**, the VBA aims to **maintain the integrity of the built environment and contribute to Victoria's economic prosperity.**



Housekeeping



Today's session will be recorded and will be available on the VBA website.



Questions can be submitted via the Q&A function. For any questions that we don't have time to answer during the session, the questions and answers will be emailed to you after the webinar.



We will be conducting live polls today. These will appear on your screen.



This webinar is scheduled to run for 60 minutes, however in some cases we may run over time in order to cover all content.



Webinar questions



We do our best to answer as many of your questions as we can during the webinar.



However, due to the high volume of questions that we receive, we may not be able to answer your question during the webinar time.



Approximately two weeks after this webinar, you will receive an email with answers to all of the questions that were asked in this webinar.

We thank you for your patience.

Purpose of the webinar

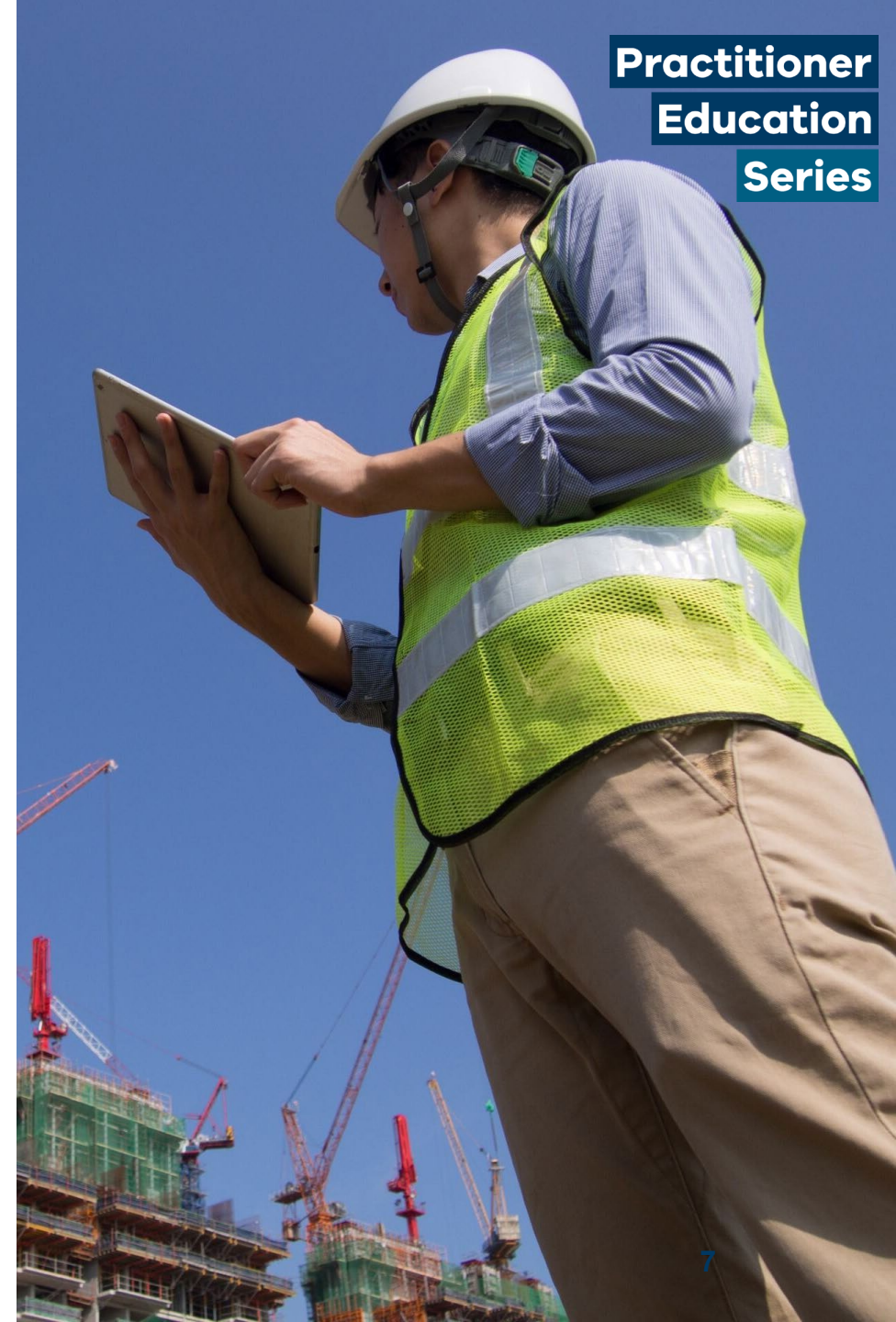
Why is this webinar important?



This webinar will remind practitioners of the fundamentals of Deemed to Satisfy drainage design.



This webinar will highlight some common enquiries



Learning goal

What will this webinar achieve?



By the end of this webinar, you will have a better understanding of the fundamentals of drainage design for various classes of buildings.





This webinar **will** explore:

- Some common Deemed-to-Satisfy requirements for the design and installation of conventional sanitary drainage from fixtures to a network utility operator's sewer, a land application system or a holding tank.
- Some common enquires received by VBA's Technical and Regulation team.

This webinar **will not** address:

- Above ground, sanitary stack or vacuum drainage systems.



For the purpose of this webinar, references to drains are references to **drains laid in PVC-U pipe and fittings** unless otherwise stated.

The information presented in this webinar is based on **AS/NZS 3500.2:2021** and the **National Construction Code 2022 (NCC)** and **Victorian Plumbing Law**.



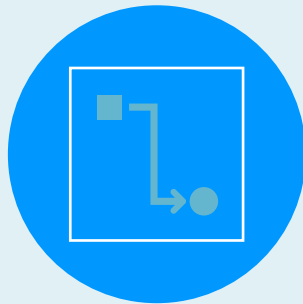
Topics the webinar will explore include:

1. Sanitary Drainage - fundamentals
2. Overflow relief, reflux valves and disconnecter gullies
3. Boundary traps inspection shaft and atmospheric venting
4. New requirements for oblique junctions



Learning goal

What will this webinar achieve?



This webinar will reinforce the fundamentals of drainage design for various classes of buildings.





Sanitary Drainage - fundamentals





What is drainage work?

The construction, installation, replacement, repair, alteration, maintenance, relining, testing or commissioning of any part of a below-ground sanitary drainage system from the above-ground sewage or waste pipes up to the approved point of connection.

What is not drainage work?

- The opening or closing of inspection opening caps and covers in sewage and waste pipes.
- The clearing of blockages, or closed-circuit television inspection of sewage and waste pipes, using existing inspection openings or removable grates.
- Design work that is carried out by a building practitioner, an architect, a draftsman, an engineer, a landscape architect, or a designer.





A sanitary drainage system must ensure sewage is transferred from a sanitary plumbing system to a disposal system that is approved by the authority having jurisdiction, these will typically include:

A network utility operator's sewer

A land application system

A holding tank

Where a point of connection to a Network Utility Operator's sewerage system is not available, an on-site wastewater management system must be designed, installed and maintained in accordance with the requirements and agreement of the relevant authority having jurisdiction.



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**Practitioner
Education
Series**





Venting and overflow relief requirements for common scenarios





Each drain must have:

1

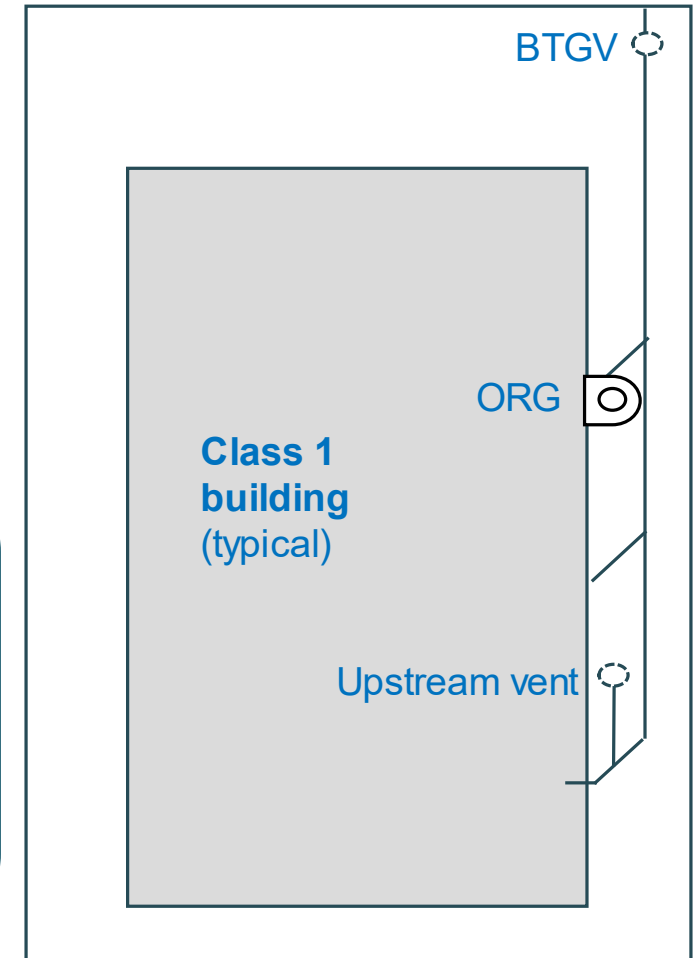
A vent located:

- at both ends of the drain if the drain incorporates a boundary trap
- at the upstream end of the drain if the drain is in a boundary trap omitted (BTO/IS) area
- at the upstream end of any branch drain that exceeds 10m from the vented drain to the weir of the trap

2

An overflow relief gully (ORG):

- a reflux valve may be used in lieu of an ORG where site is entirely built on and there are no acceptable alternate locations, or
- the ORG may be omitted where the lowest fixture connected to the drain is at least 3m above the ground at the point of connection



Fundamental components of sanitary drainage – Typical 2 buildings

Each drain must have:

1

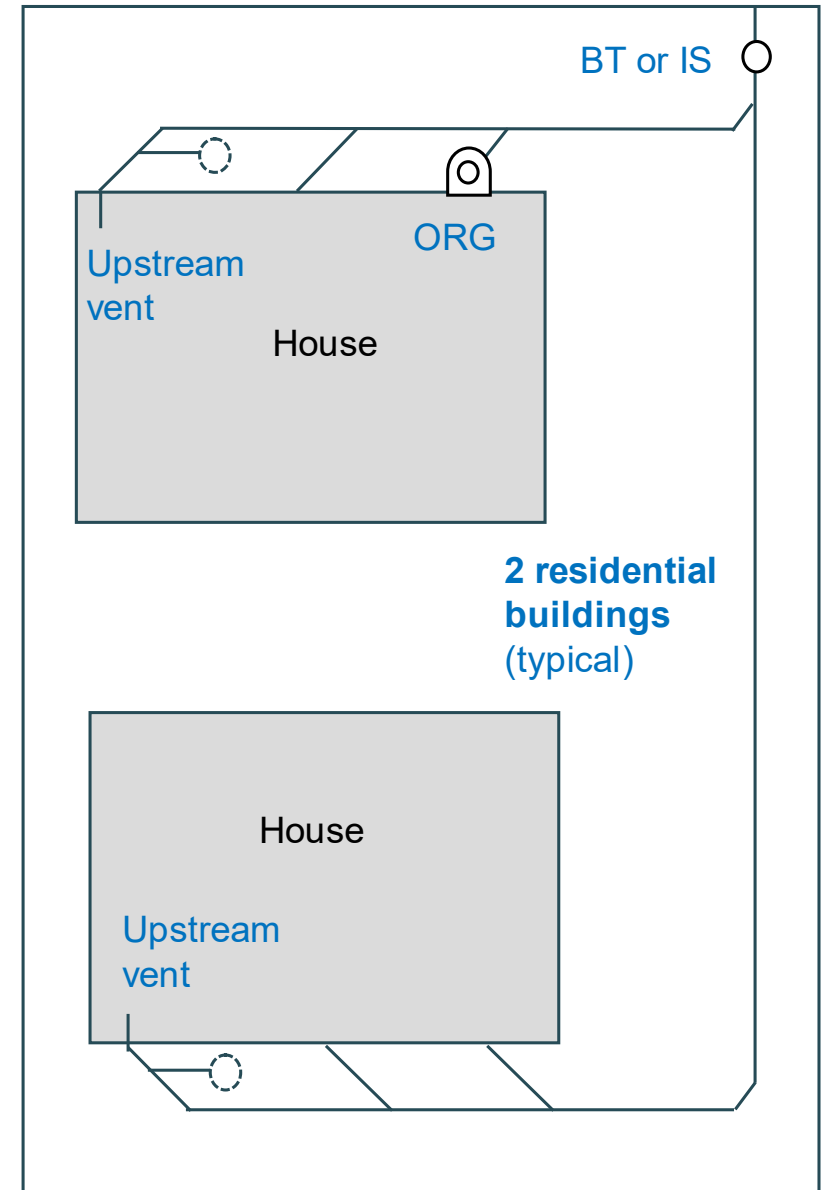
A vent located:

- at the upstream ends of each building
- at the downstream end of the drain if the drain incorporates a boundary trap
- at the upstream end of any branch drain that exceeds 10m from the vented drain to the weir of the trap

2

At least one overflow relief gully (ORG):

- a reflux valve may be used in lieu of an ORG where site is entirely built on and there are no acceptable alternate locations, or
- the ORG may be omitted where the lowest fixture connected to the drain is at least 3m above the ground at the point of connection



Fundamental components of sanitary drainage – Typical 3 or more residential buildings

Each drain must have:

1

A vent located:

- at the upstream ends of **each building**
- at the downstream end of the drain if the drain incorporates a boundary trap
- at the upstream end of any branch drain that exceeds 10m from the vented drain to the weir of the trap

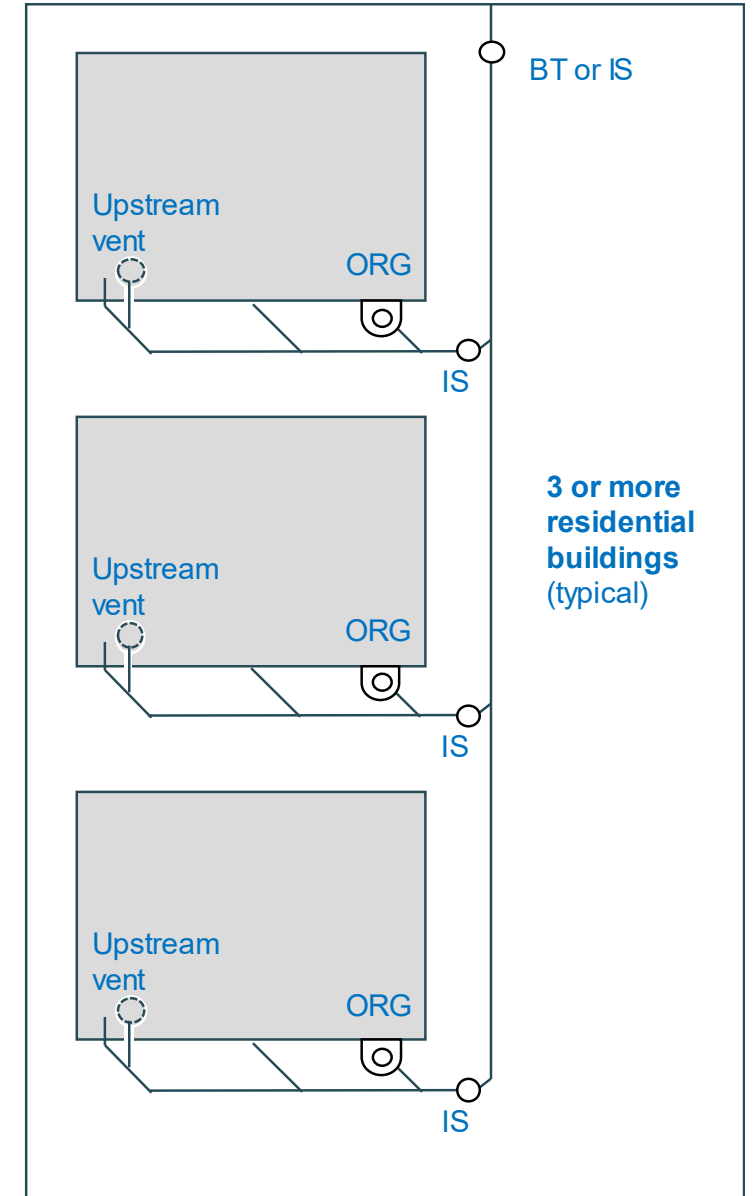
2

At least one overflow relief gully at each building:

- a reflux valve may be used in lieu of an ORG where site is entirely built on and there are no acceptable alternate locations, or
- the ORG may be omitted where the lowest fixture connected to the drain is at least 3m above the ground at the point of connection

3

An inspection shaft at or near surface level at each building



Fundamental components of sanitary drainage – Typical commercial/industrial buildings (Class 8 factory unit)

Each drain must have:

1

A vent located:

- at the upstream end of the drain
- at the downstream end of the drain if the drain incorporates a boundary trap
- at the upstream end of any branch drain that exceeds 10m from the vented drain to the weir of the trap

2

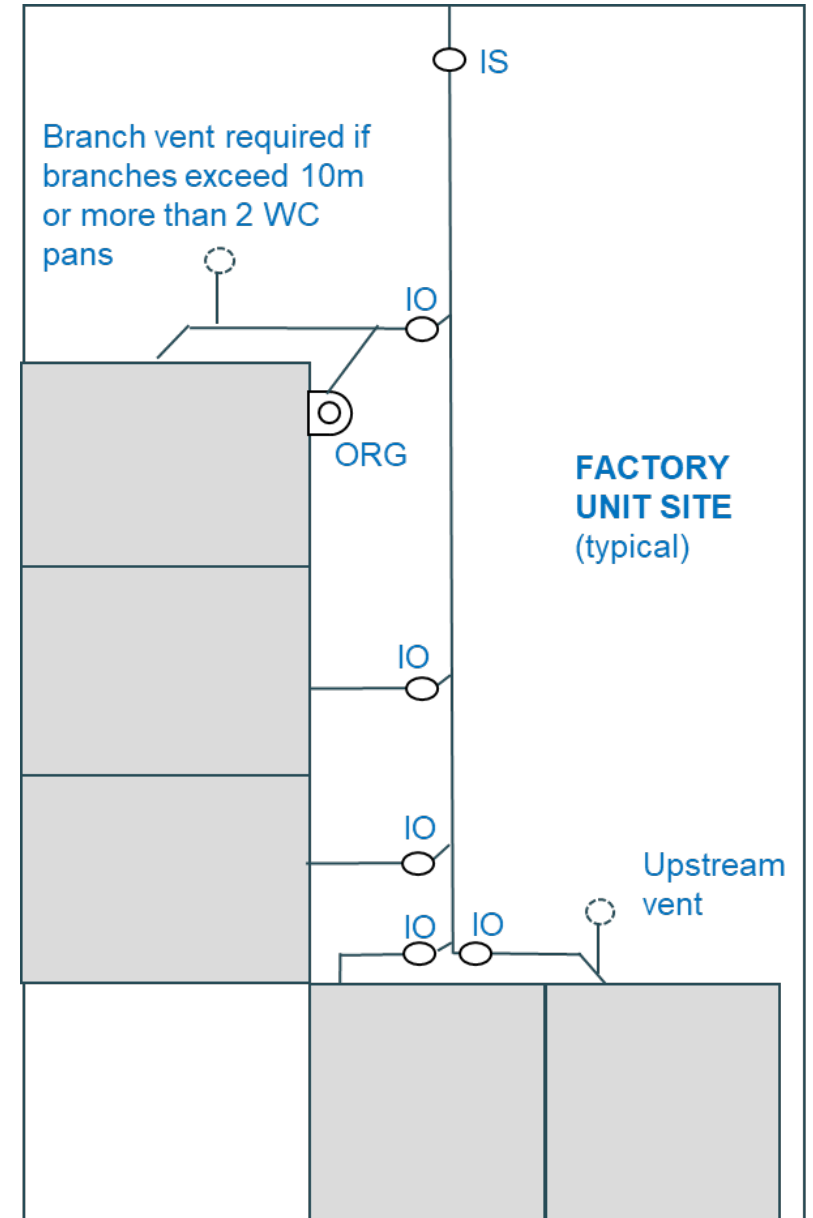
At least one overflow relief gully (ORG):

- a reflux valve may be used in lieu of an ORG where site is entirely built on and there are no acceptable alternate locations, or
- the ORG may be omitted where the lowest fixture connected to the drain is at least 3m above the ground at the point of connection

3

An inspection opening (IO) at each building

- it is recommended that the IO is raised to ground



Fundamental components of sanitary drainage – Typical Class 2 buildings (apartments)

Each drain must have:

1

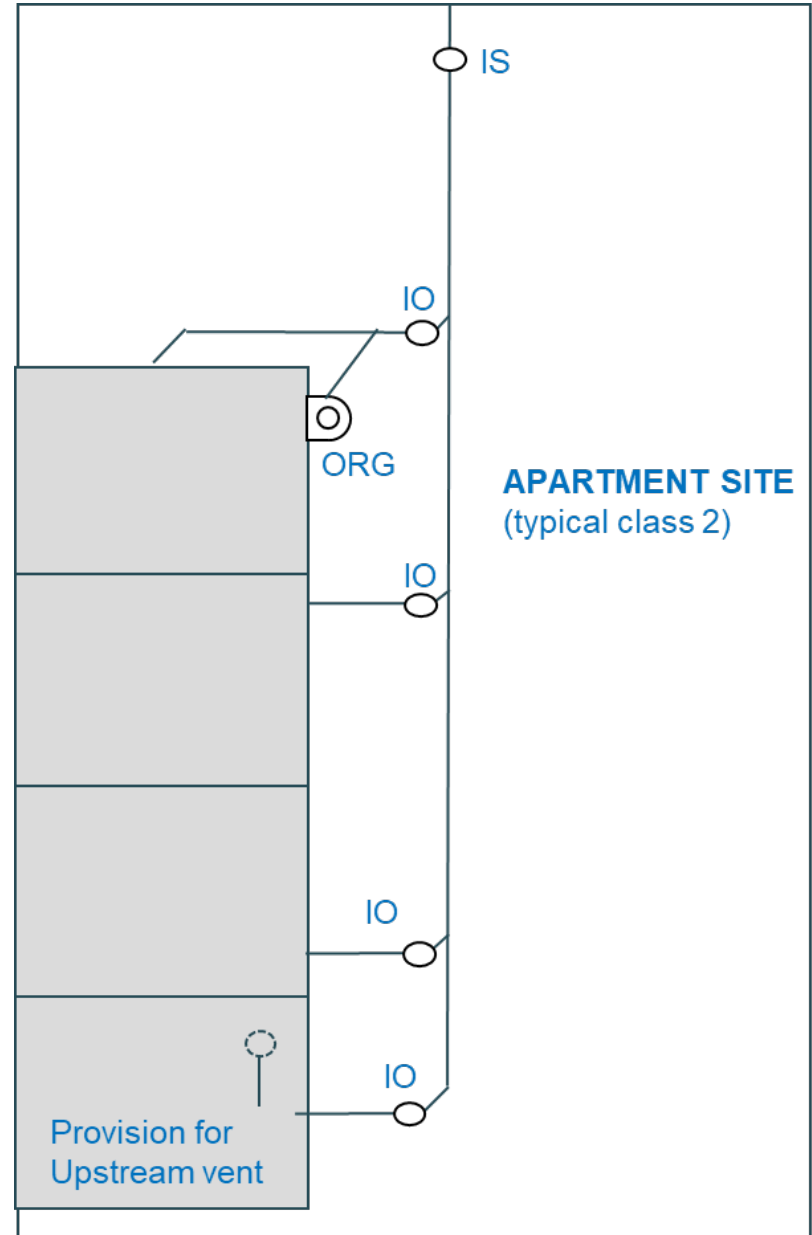
Provision for ventilation:

- at the upstream ends of each building
- at the downstream end of the drain if the drain incorporates a boundary trap
- at the upstream end of any branch drain that exceeds 10m from the vented drain to the weir of the trap

2

At least one overflow relief gully (ORG):

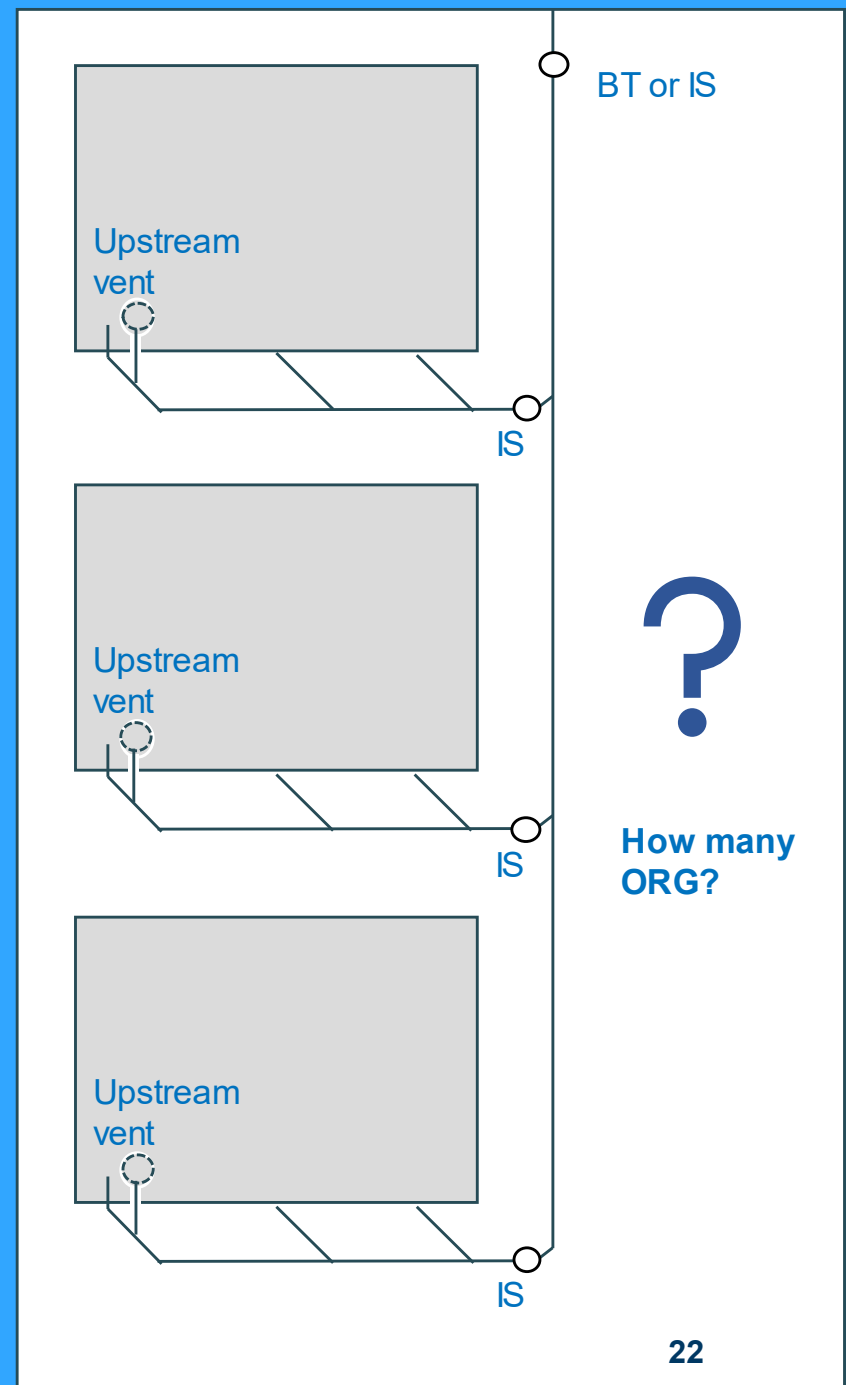
- A reflux valve may be used in lieu of an ORG where site is entirely built on and there are no acceptable alternate locations, or
- The ORG may be omitted where the lowest fixture connected to the drain is at least 3m above the ground at the point of connection



Quick quiz

How many overflow relief gullies are required in a multi-unit development of 3 or more **residential buildings**?

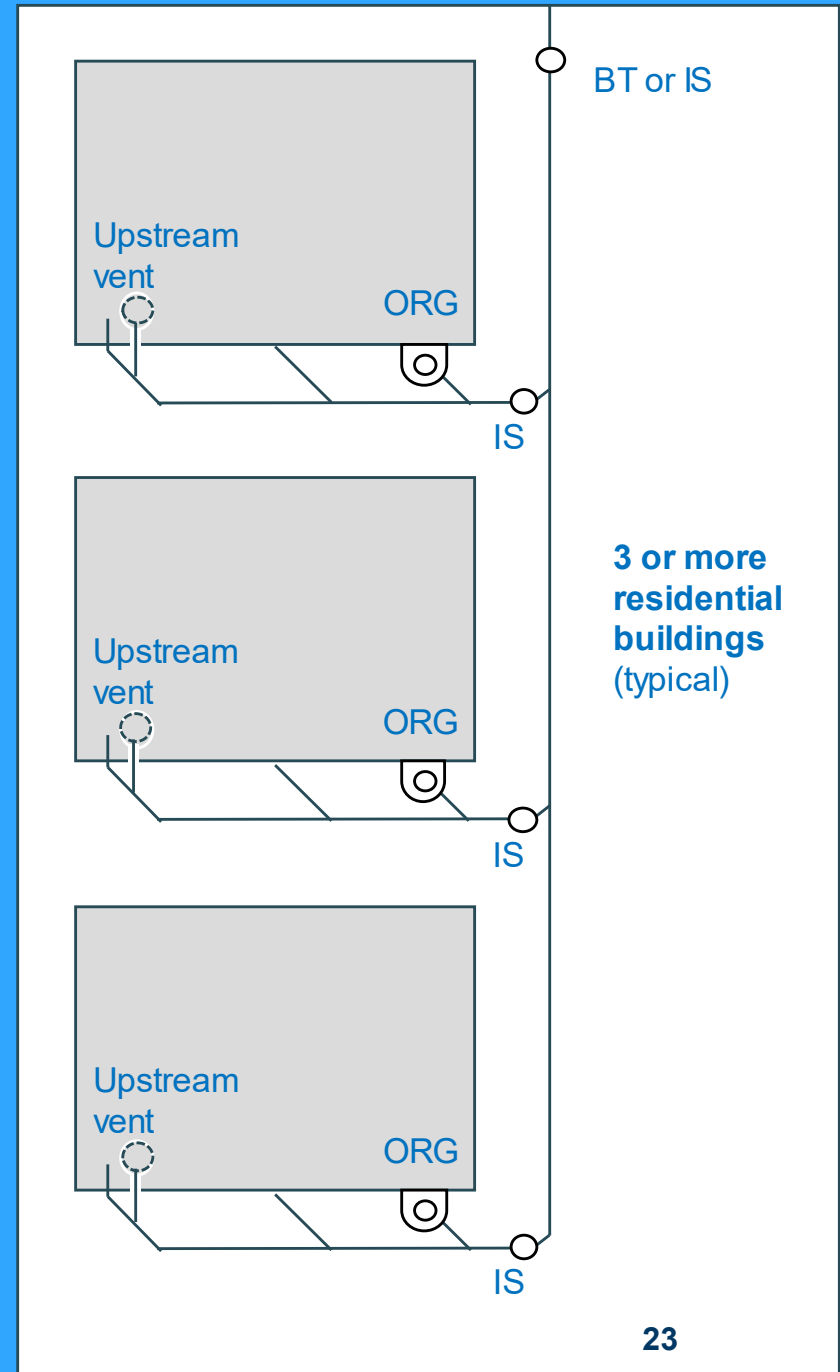
- a) 1 per building
- b) 1 for the whole site
- c) None



Quick quiz

How many overflow relief gullies are required in a multi-unit development of 3 or more **residential** buildings?

a) 1 per building





Drain locations and typical sizing parameters



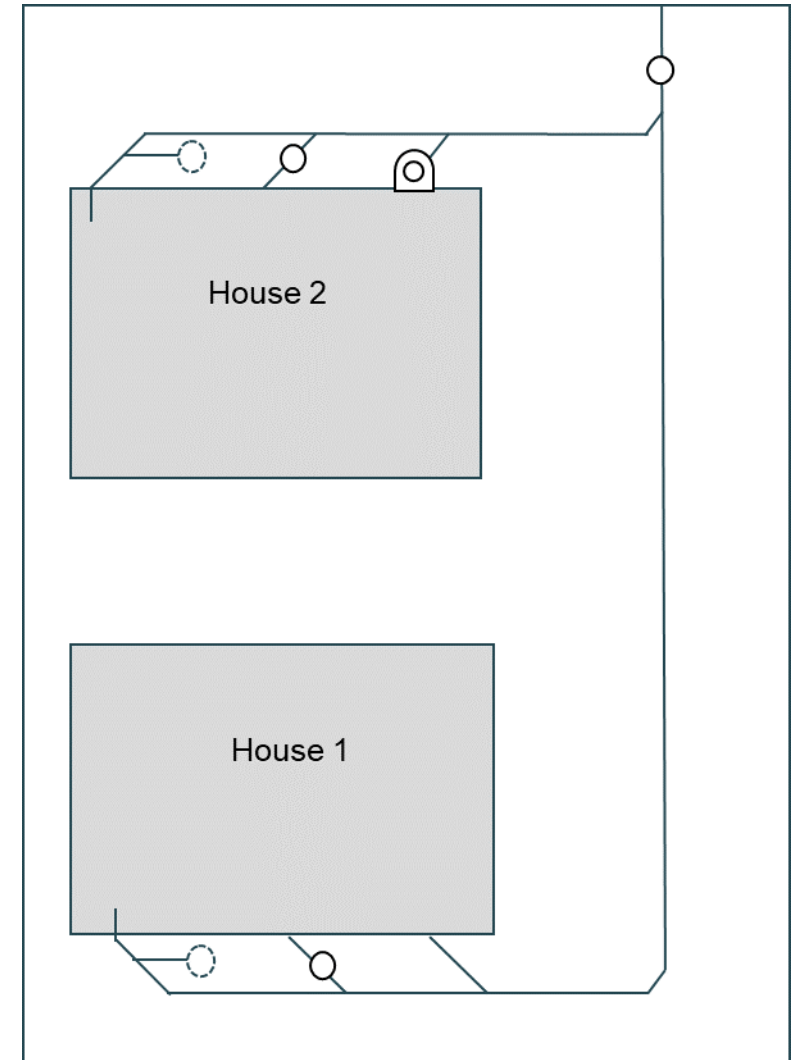


If a drain is located under or inside a building it should only serve fixtures within that building.

Where a this is not practicable, the Plumbing Regulations 2018 make provision for drains that serve other buildings to be laid under another building provided the following conditions are met:

- The drain is laid as a straight line of drain under the building;
- The drain has inspection shafts terminating at the finished surface level, installed in permanently accessible positions, in the open air at the upstream entry and downstream exit points of the building;
- There are no branches or changes in direction in the drain between the inspection shafts

(Ref: Plumbing Regulations 2018, Schedule 2, Part 1, Division 1)



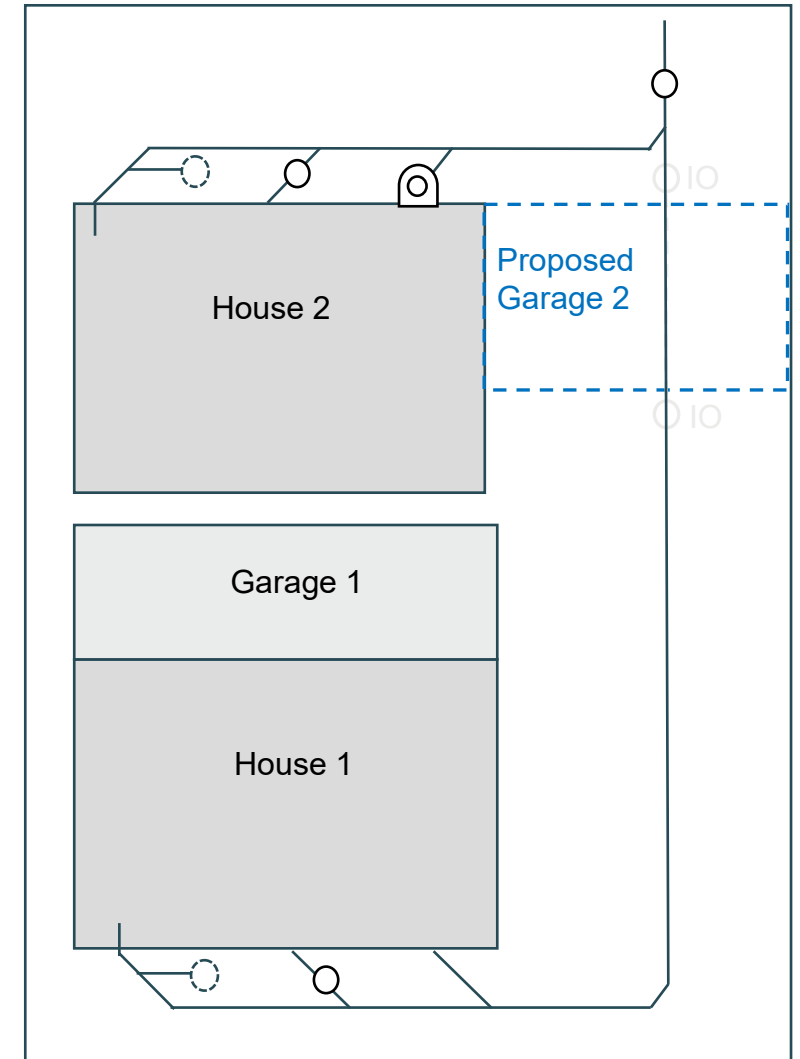
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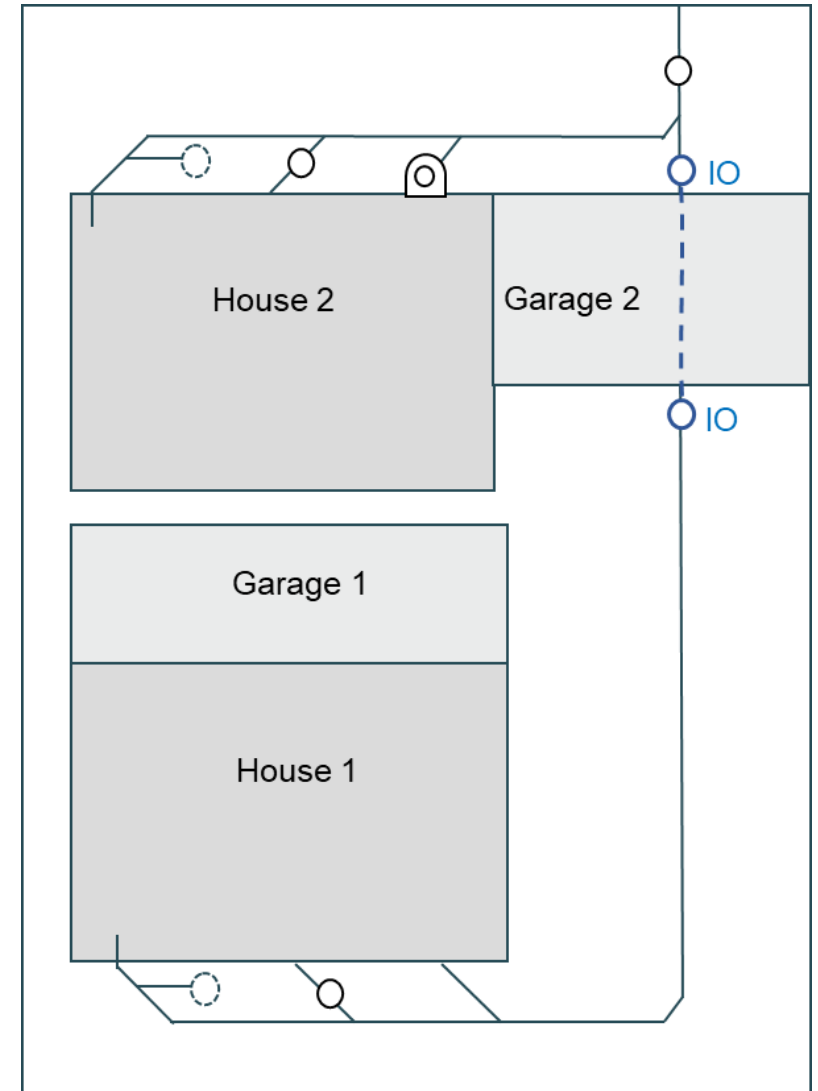
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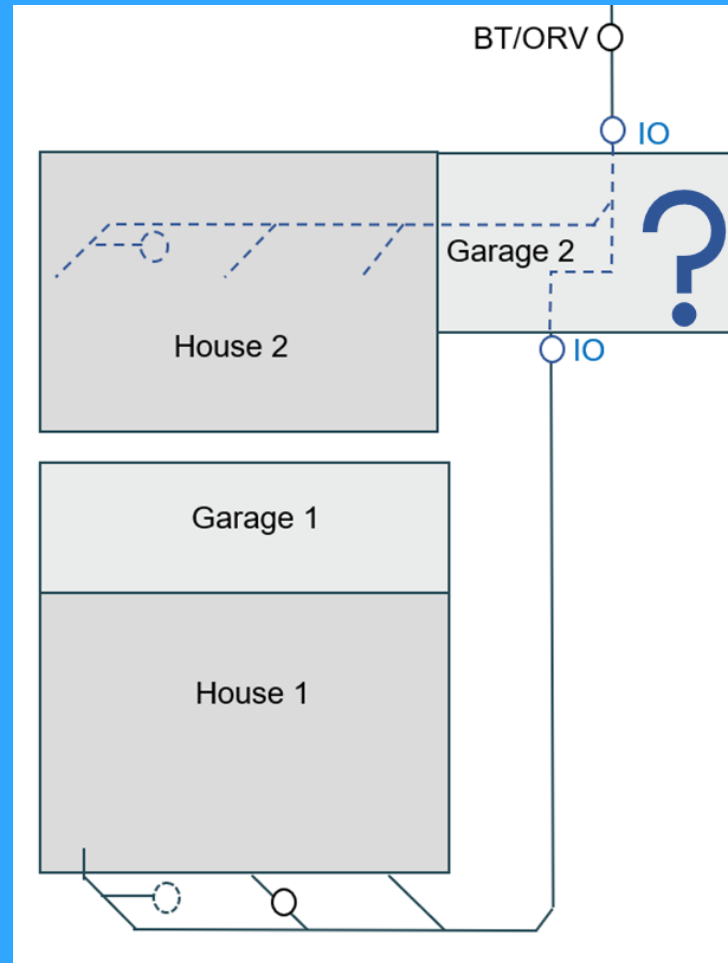
(Ref: Plumbing Regulations 2018, Schedule 2, Part 1, Division 1)



Quick quiz

In the figure below, does the drain under garage 2 comply with the Plumbing Regulations 2018?

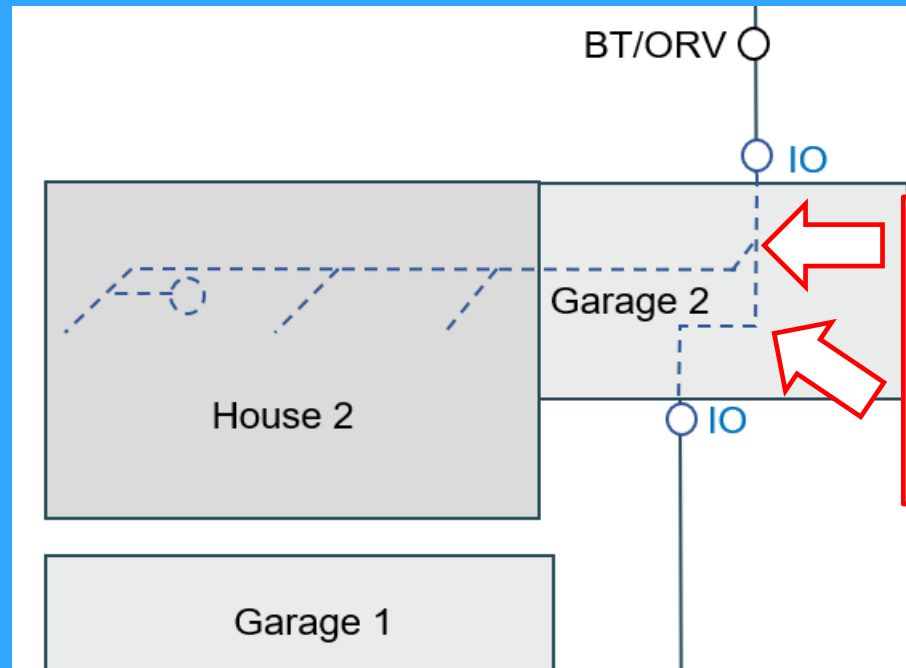
- a) Yes
- b) No
- c) Not sure



Quick quiz

In the figure below, does the drain under garage 2 comply with the Plumbing Regulations 2018?

b) No



Connection and offset are not permitted under the building



Main drain minimum size: must not be less than DN 100

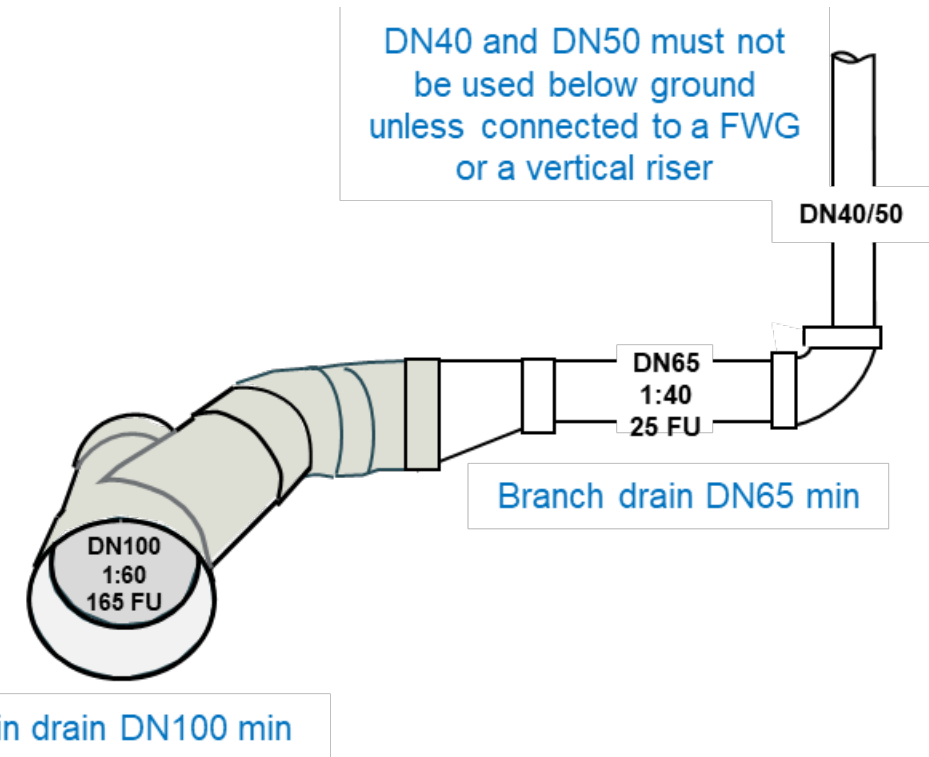
Branch drain minimum size: must not be less than DN 65

DN100 drains laid at 1:60 should not exceed 165 FUs

Drains should be sized by the number of fixture units and type of fixtures discharging into it

Drains should not be upsized to reduce grade

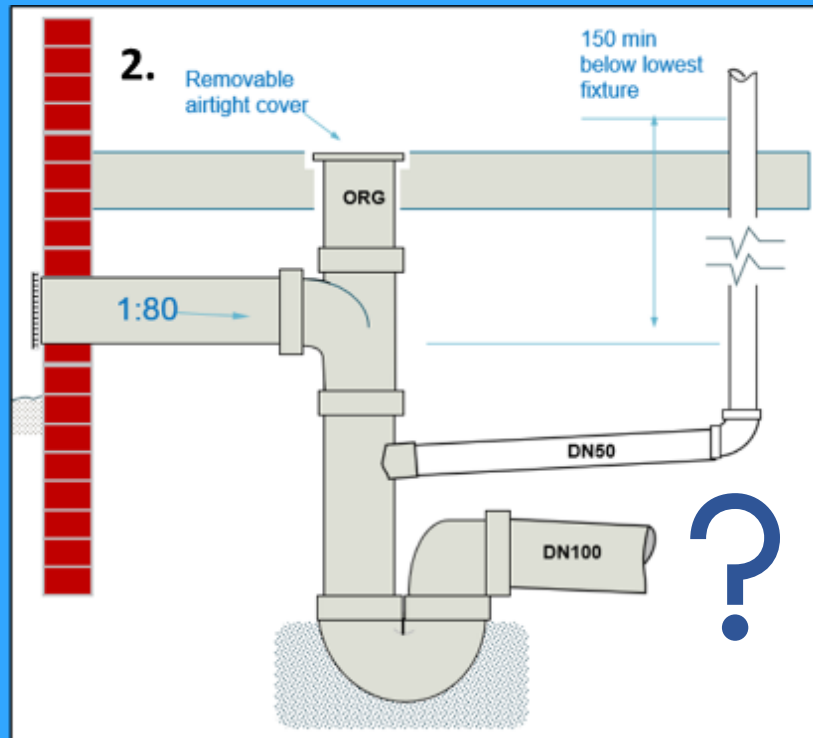
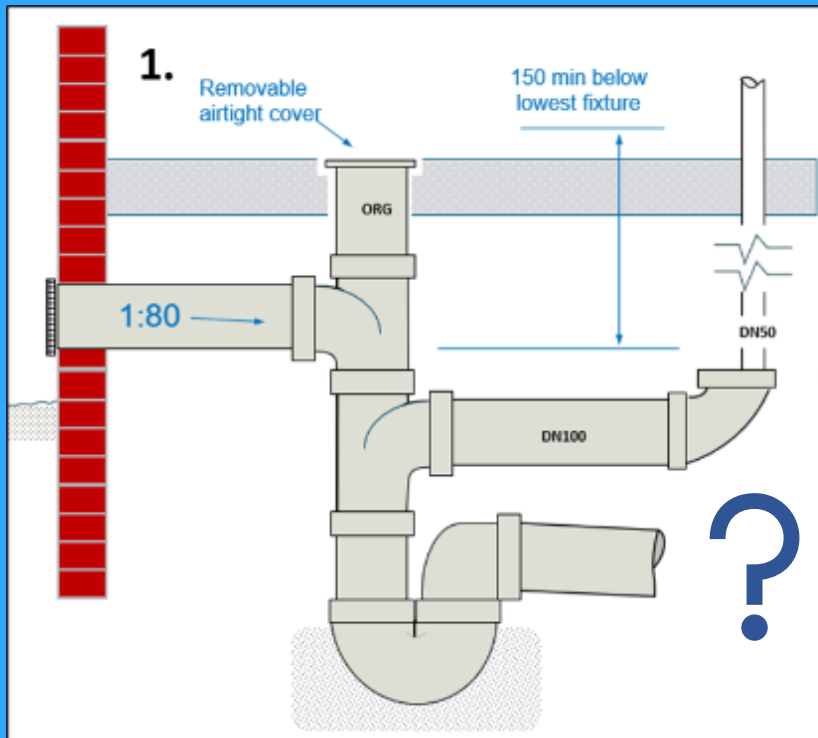
Discharge pipes of DN 50 or smaller must not be installed below ground unless they are connected to a floor waste gully or the vertical riser from a graded drain (VIC C2D4(2))



Quick quiz

Which wastepipe configuration is correct?

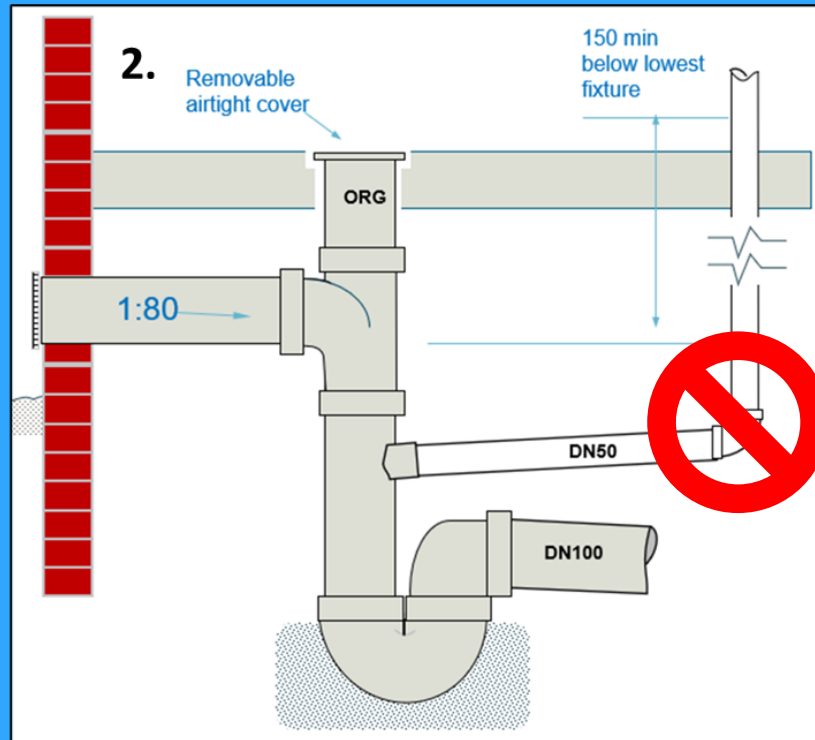
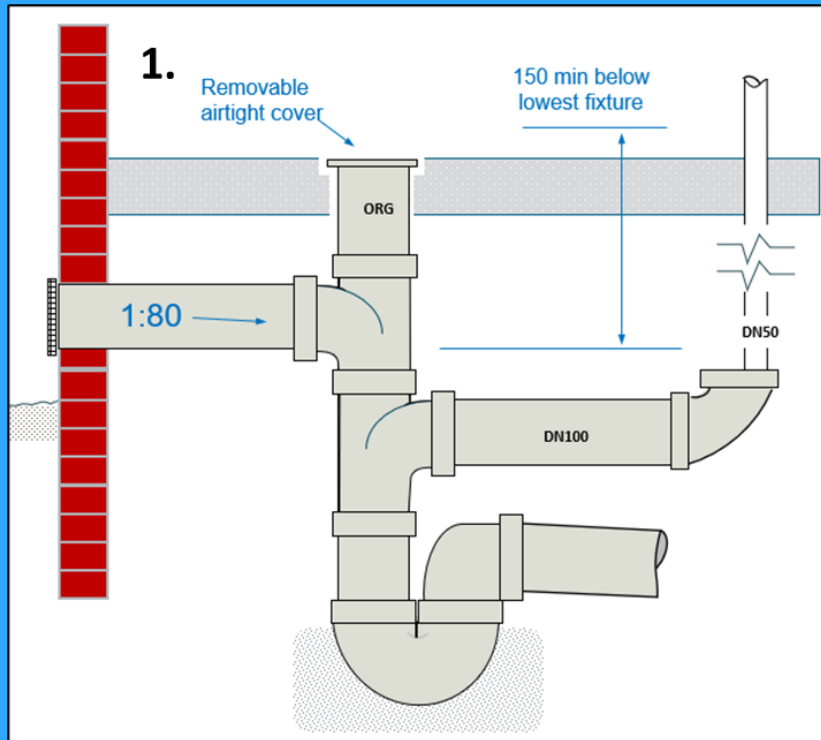
- a) 1
- b) 2
- c) Both 1 and 2



Quick quiz

Which wastepipe configuration is correct?

a) 1





Depth of cover

Minimum depth of cover for uPVC pipes

Location	Min. overlay	Reinforced concrete	Brick or concrete paving
Subject to vehicular traffic	500mm		
	50mm	100mm	
Subject to light vehicular traffic	50mm		75mm
Drains below ground and under buildings	25mm		
Other locations – Not subject to vehicular	300mm		

Concrete or paving must extend the full width of the trench or drain must be mechanically protected from damage

Minimum below ground separation between drains and other services

Other services protected & marked/unprotected	Stormwater drain	Electrical supply cables	Consumer gas pipes	Comm-unication cable	Water service
Marker tape for full length and mechanically protected		100mm	100mm		
Unprotected		600mm	600mm		
Electrical earth stake supply up to 1000V supply over 1000V		500mm Contact ESV for advice			
Protected or unprotected				100mm	100mm
Less than DN 100 More than DN 100	100mm 300mm				
Vertical separation between any underground drain crossing a service (angle of crossing not less than 45°) (shallowest drain or service marked for 1m either side of crossing)	100mm	100mm	100mm	100mm	100mm



Re-use of drains where buildings are demolished or removed

Where a building is demolished and replaced, existing drains must also be completely replaced to the point of connection.

However, **drains may be reused if;**

Renovated mortar-jointed vitrified clay, mortar-jointed concrete, asbestos cement and fibre-reinforced cement pipes have a structural plastic liner.

Other materials are compliant with the standard e.g., grade, bedding and testing.



Re-use of drains where buildings are demolished or removed

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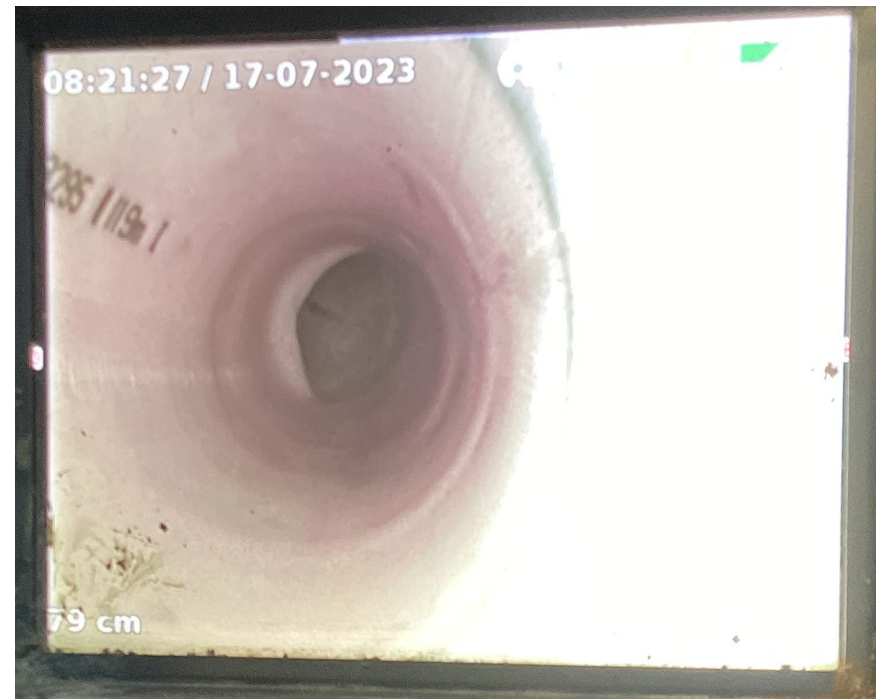
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Practitioner Education Series



PN DR03
– Property Sewer Drains

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PN DR03
– Property Sewer Drains

Building over drains

When making **alterations** or **additions** to buildings, the **footing system should not be placed over or adjacent to existing drains.**

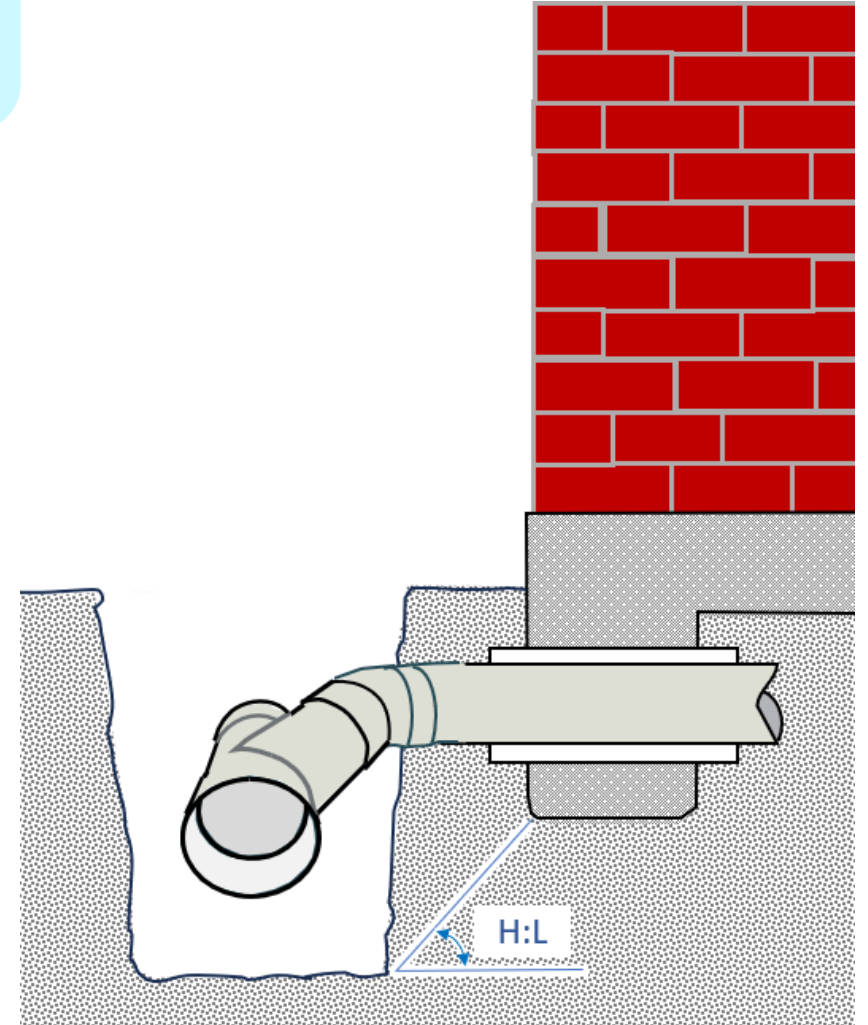
Unless appropriate clearances have been achieved:

angle of intersection with the footing

annular space for wall and footing penetrations

Installation of flexible joints*, and;

angle of repose from existing footings





Building over drains



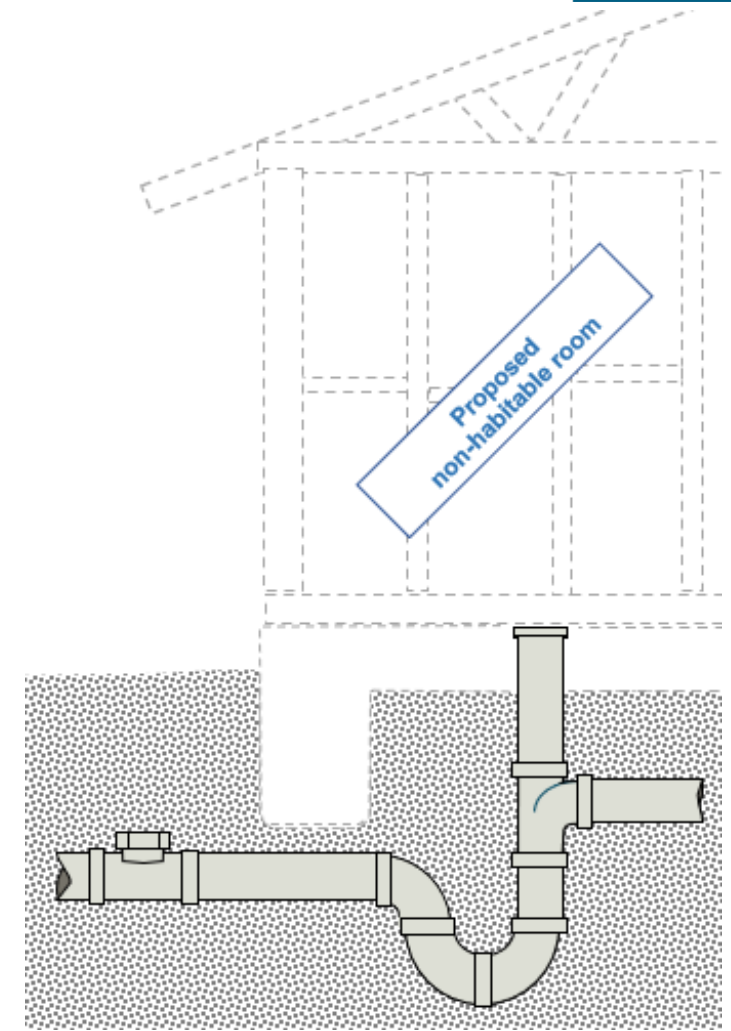
Inspection shafts and boundary traps should not be built over.

When unavoidable the inspection shaft or boundary trap may be located:

under a roofed area

or in a recess

subject to the requirements of the Standard





Inspection shafts and boundary traps



Inspection shafts and boundary traps: General requirements

Each main drain must be provided with a **boundary trap** in a boundary trap area, or an **inspection shaft** in a boundary trap omitted area.

Inspection shafts and boundary traps must be located*:

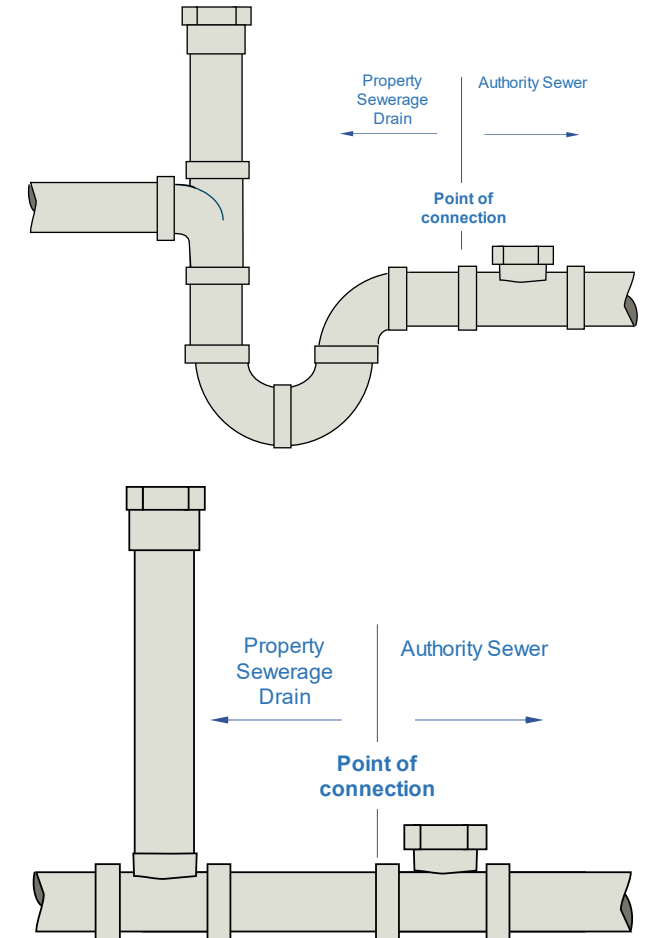
in an **accessible** position in the open air

finished with an **appropriate cover** (light or heavy)

wholly **within the property** that it serves

as near as practicable to the **property boundary** and the **point of connection to the reticulated sewer**, and **clear of easements** (unless approved by the easement owner)

(*provisions for alternative locations may apply)



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Inspection shafts and boundary traps

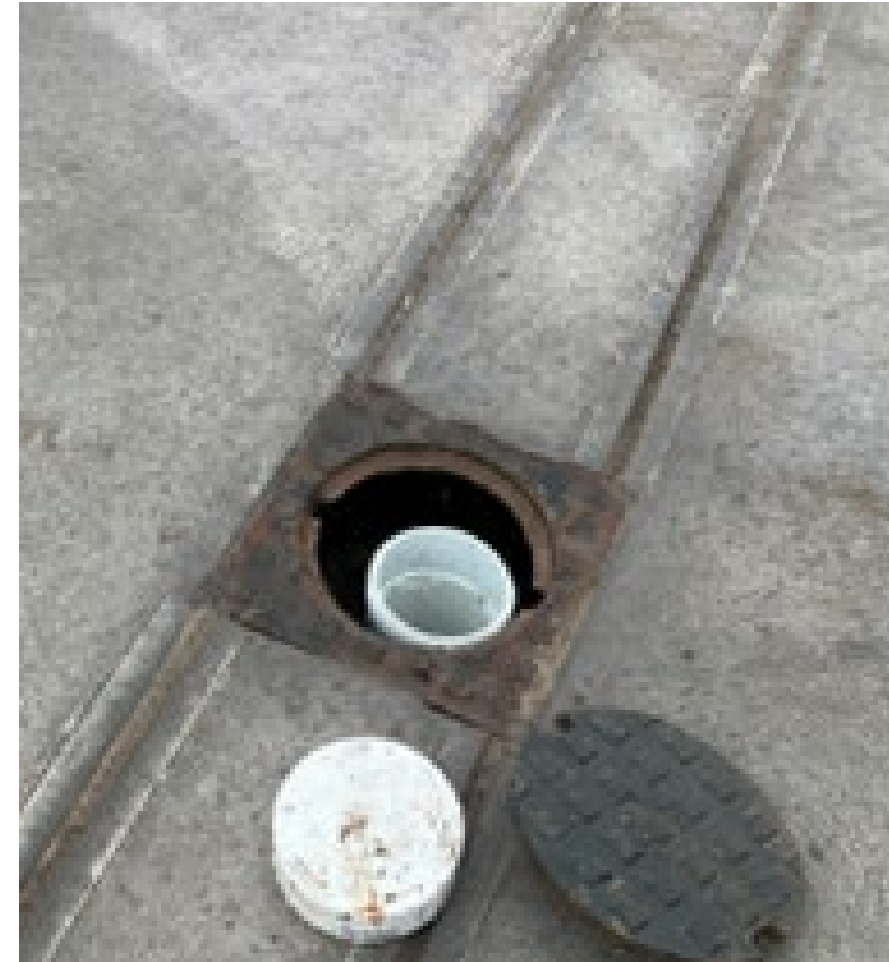
Alternative location 1

Where the inspection shaft or boundary trap cannot be sited in an accessible open-air position an alternative position may be used:

Under cover

Inspection cap may be installed **under a roofed area** provided the cap is:

- **finished surface level**, and
- **readily accessible** with not less than 1m clear space above the cap
- fitted with an **airtight cap**



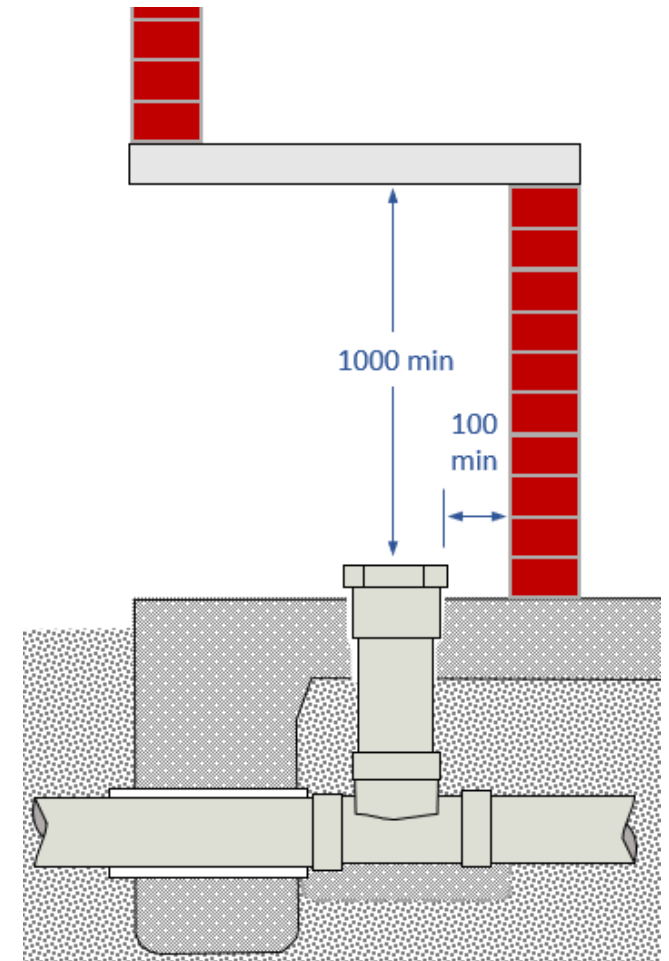
Inspection shafts and boundary traps

Alternative location 2

In a recess

Inspection cap may be **recessed into the external wall** of a building if:

- The building is constructed up to the boundary and it is **impracticable to site the inspection cap in the open air or under cover**
- The inspection cap is **airtight** with a **100mm clear space around the cap**
- **1m of clear space** above the cap
- The recess has a **removable panel**





Inspection shafts (IS) and boundary traps (BT)

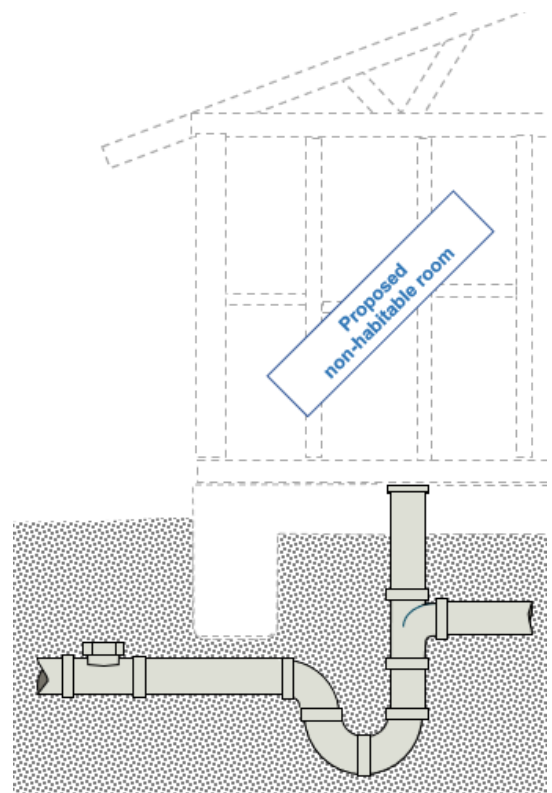
Alternative location 3

Below ground inside a building (not in a habitable room)

- bathroom
- laundry
- toilet
- pantry
- walk-in wardrobe
- hallway
- garage*

Above ground inside a building

- basement



Where the drain serves more than one building / dwelling, the IS or BT must be in a readily accessible area, ideally a common area.

Inside a building the shaft must be sealed with an air-tight cap and 1m of clear space provided above the cap



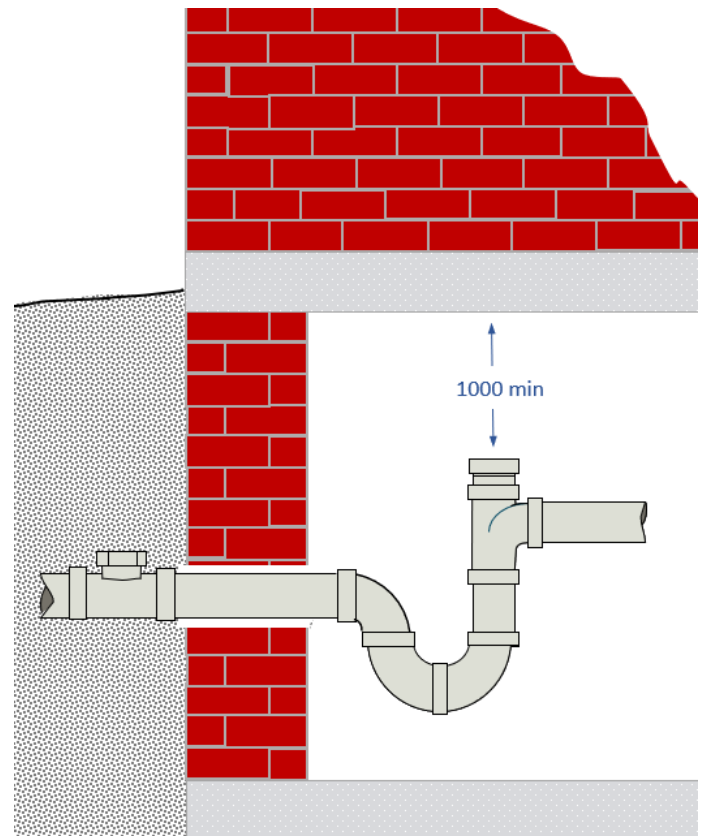
Inspection shafts (IS) and boundary traps (BT) Alternative location 3

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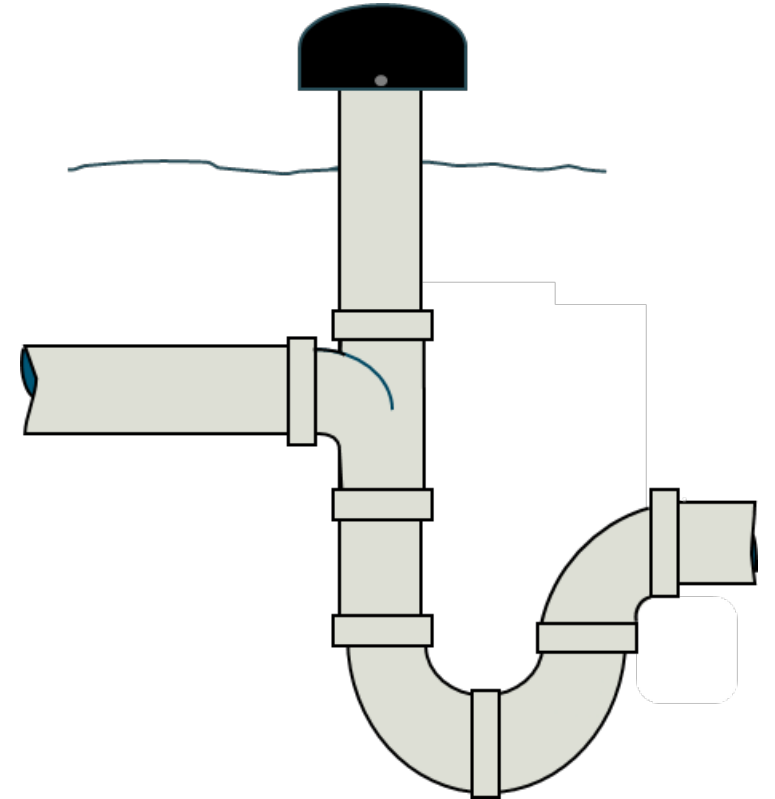
Inside a building the shaft must be sealed with an **air-tight cap** and **1m of clear space** provided above the cap

Drains incorporating a **boundary trap** must have an appropriately sized **downstream vent** connected within 10m of the boundary trap riser.

No fixtures or other connections are permitted between the BT and the junction to which the vent connects.

Downstream ventilation can be provided by:

- A **ground vent** directly on top of the BT shaft (this could also be used as the ORG)
- A junction connected to the BT riser and leading off to an atmospheric or ground vent
- A junction connected to the drain within 10 m of BT riser and leading off to an atmospheric or ground vent
- The connection of riser that incorporates a stack vent is also acceptable

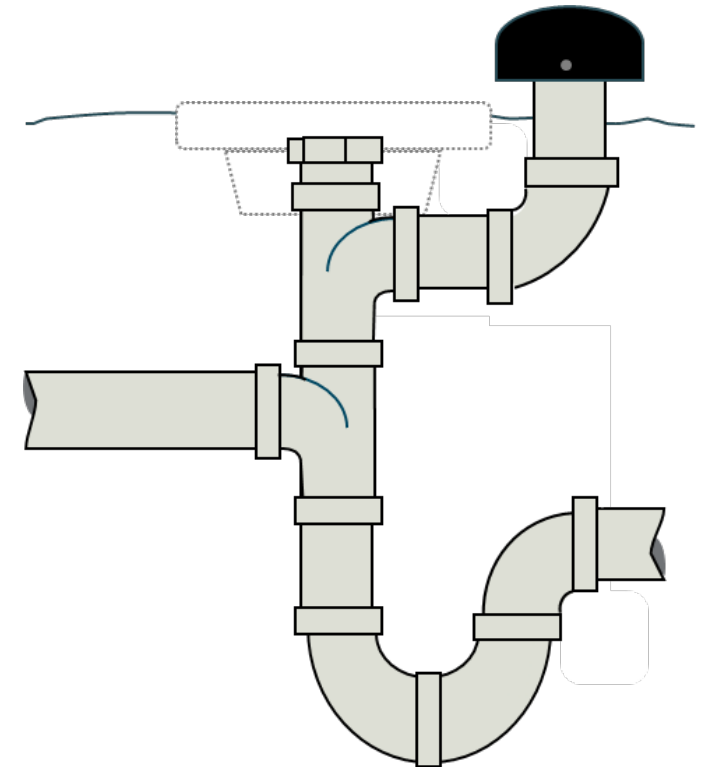


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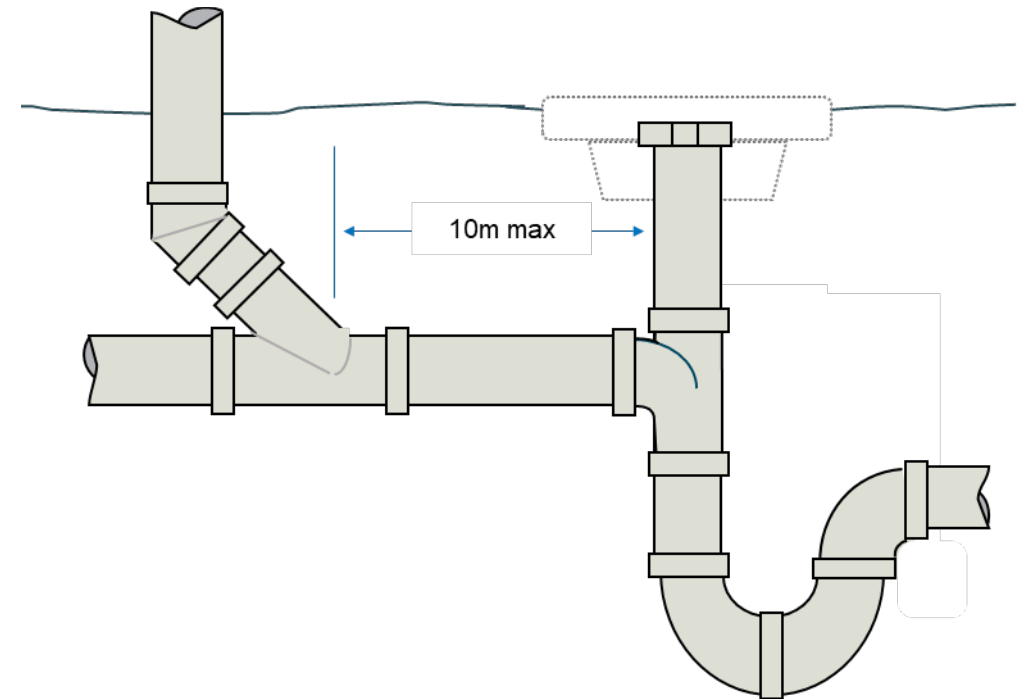


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- A junction connected to the **drain** within 10 m of the BT riser and leading off to an atmospheric or ground vent
- The connection of riser that incorporates a stack vent is also acceptable





Quick quiz

When must a drain have an appropriately sized downstream vent?

- a) When the drain is in a BT omitted area
- b) When the drain has an IS
- c) When the drain incorporates a BT
- d) All of the above





Quick quiz

c) When the drain incorporates a BT



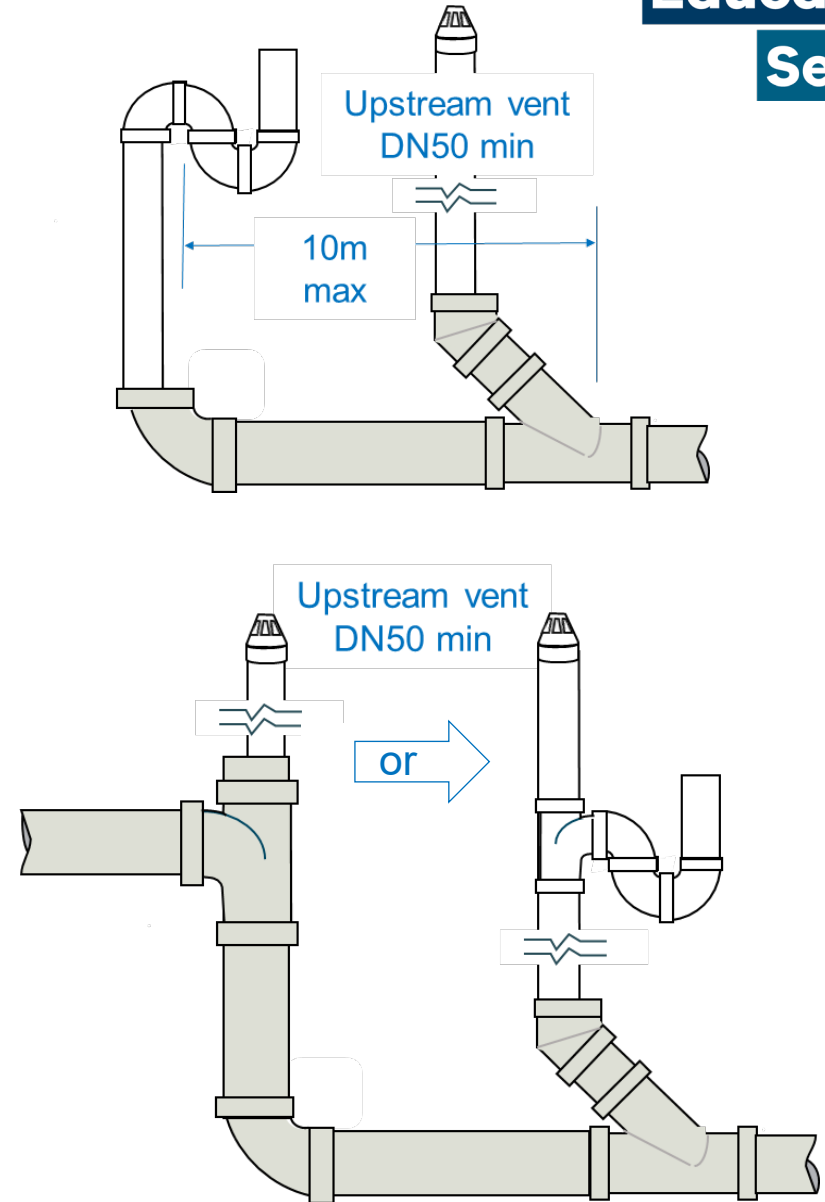
Upstream vent connections

An **upstream vent** on any drain must be connected:

to the drain downstream of a fixture or drainage trap connection, or

at the vent extension of a stack (or waste pipe*) located near the upstream end of the drain, and

so that the unvented drain upstream of the vent connection does not exceed 10m in length



Minimum size of vents

All drainage systems must have an upstream vent open to atmosphere **sized** for the entire system.

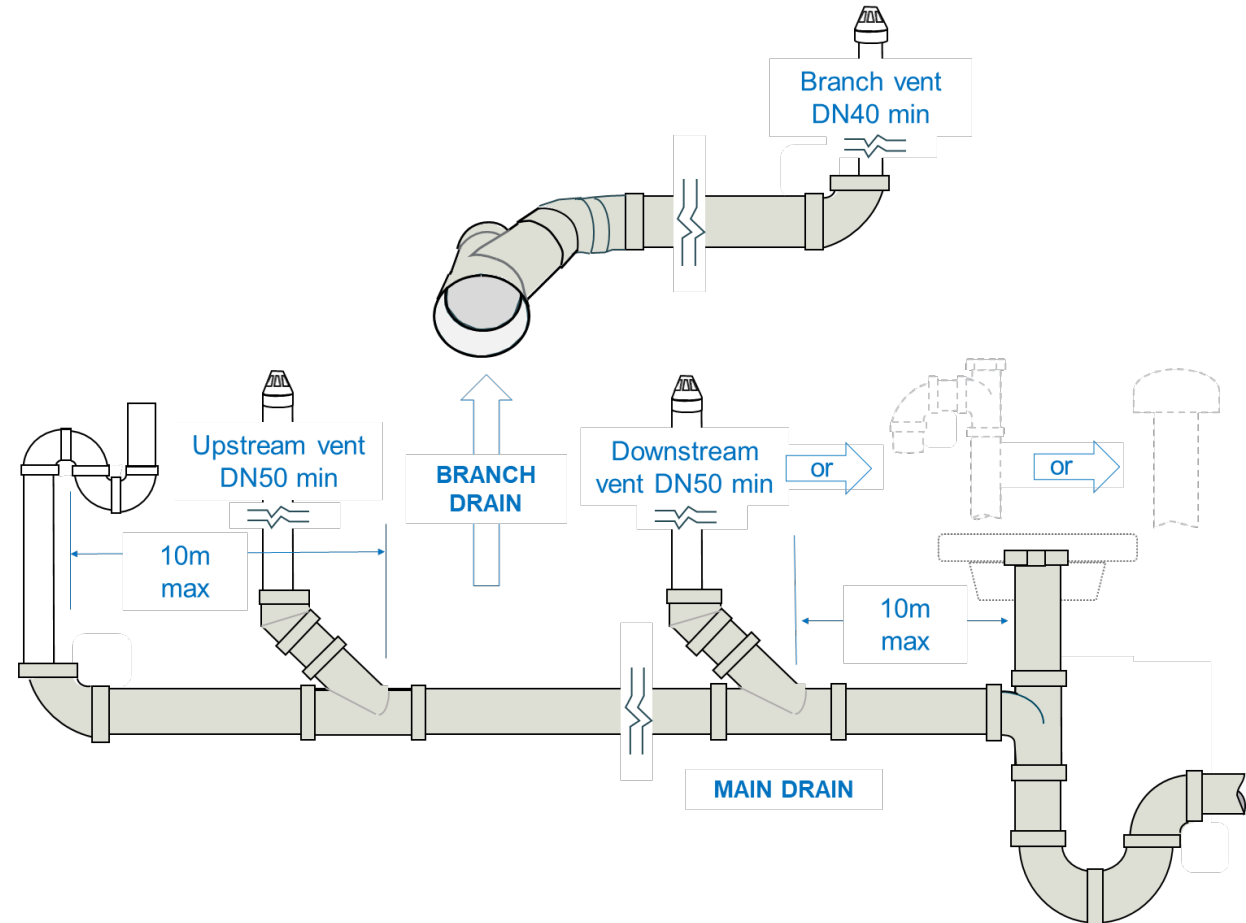
Atmospheric ventilation may be provided by an **appropriately sized** single vent or by several vents which provide the same or greater cross-sectional area.

Under no circumstances should vents be smaller than the following minimums:

Upstream vents shall not be smaller than DN50

A ground vent shall not be smaller than DN 50 (cannot act as an ORG)

Branch vents shall not be smaller than DN40 (may be replaced by AAV)





Minimum size of vents

All drainage systems must have an upstream vent open to atmosphere sized for the entire system

Atmospheric ventilation may be provided by an appropriately sized single vent or by several vents which provide the same cross-sectional area

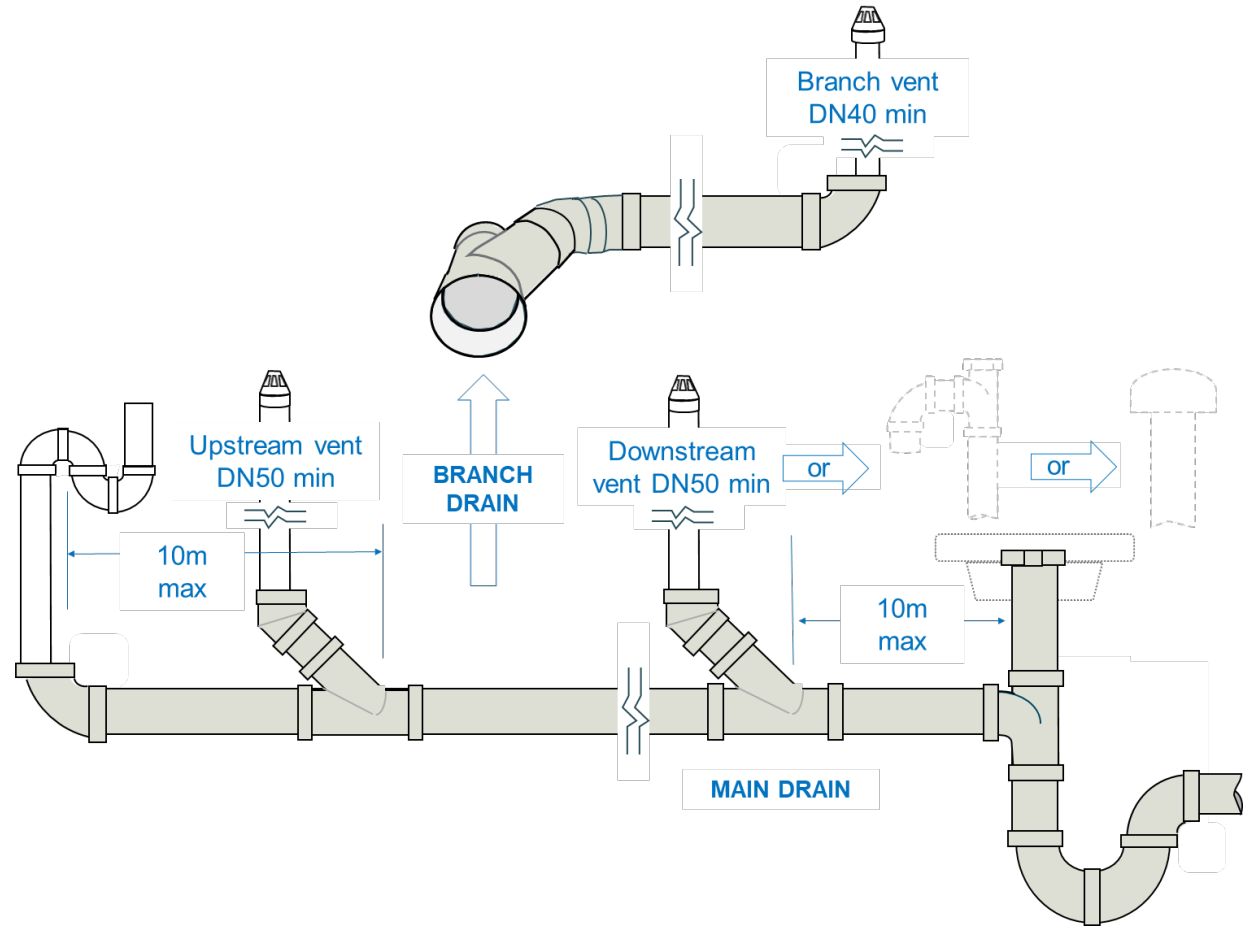


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Upstream vents shall not be smaller than DN50

A ground vent shall not be smaller than DN 50 (cannot act as an ORG)

Branch vents shall not be smaller than DN40 (may be replaced by AAV)





Air admittance valves (AAVs)

AAVs may be used to ventilate a branch drain provided the system has **at least one upstream vent** on the main drain which is open to atmosphere.



**AAVs
must not
be used
for:**

Upstream venting of a main drain

Venting of boundary trap, or

to vent an interceptor appliance





Quick quiz

Can an Air Admittance Valve (AAV) be used as an upstream vent on a main drain?

- a) Yes
- b) Yes, if it has a downstream vent
- c) No
- d) Not sure





Quick quiz

Can an Air Admittance Valve (AAV) be used as an upstream vent on a main drain?

c) No



Boundary traps and overflow relief

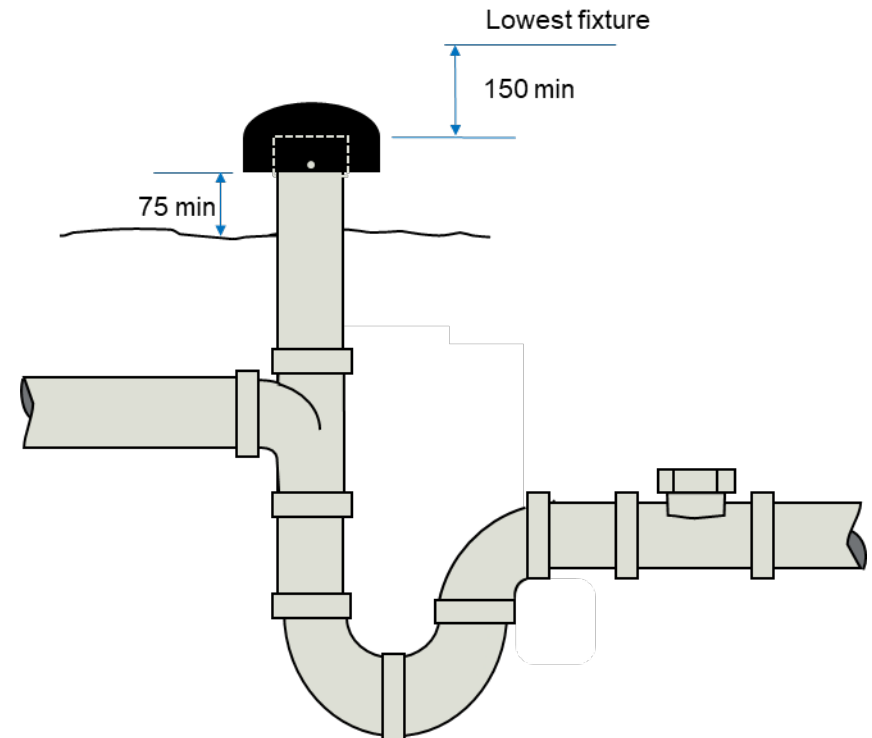
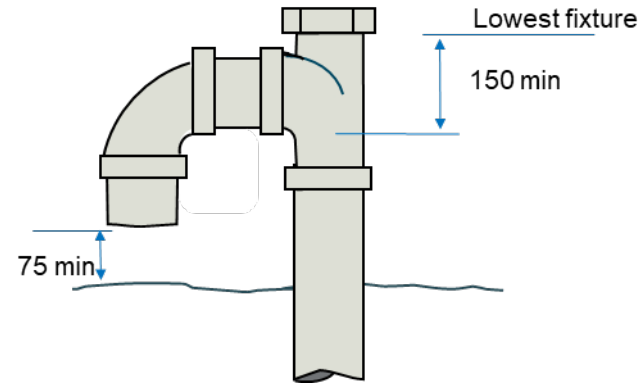
The overflow height is not less than 150mm below the lowest fixture connected to the drain, and

75mm above ground level or if installed in a paved area, finished at a level that will prevent water ingress

Where a low-level vent serves as an OGV it must terminate 150mm above ground level and 150mm below the lowest fixture

A boundary trap may also serve as an overflow relief gully provided:

Where a BT also serves as an ORG and is installed within a building or alternative location, the BT must comply with the same provisions as a regular ORG in an alternate location.



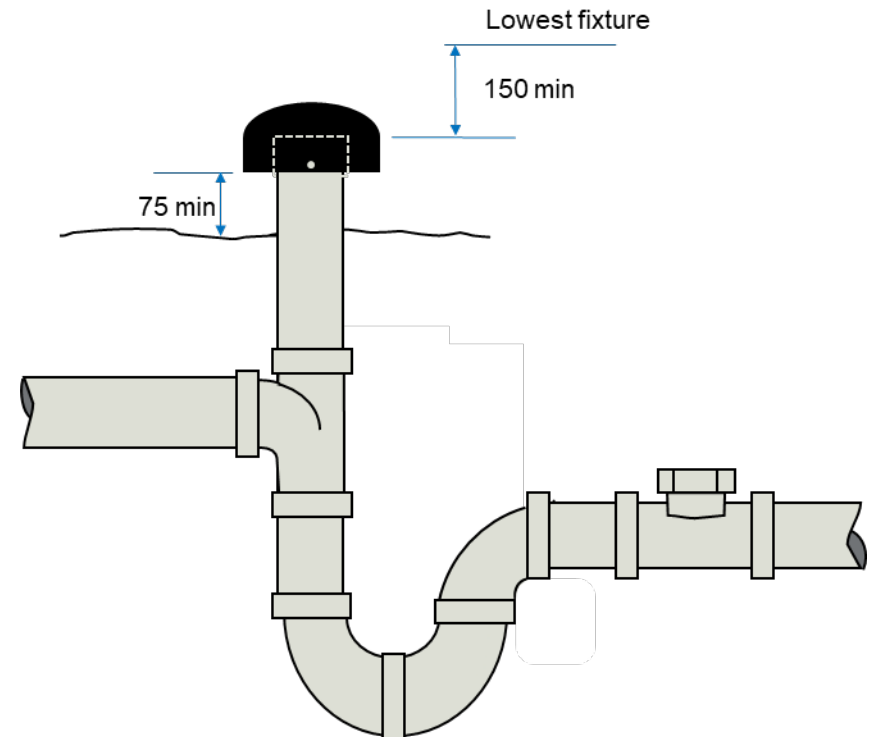
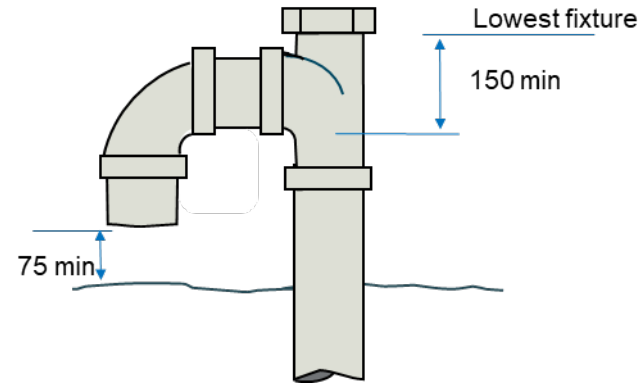
Boundary traps and overflow relief

The overflow height is not less than 150mm below the lowest fixture connected to the drain, and

75mm above ground level or if installed in a paved area, finished at a level that will prevent water ingress

Where a low-level vent serves as an OGV it must terminate 150mm above ground level and 150mm below the lowest fixture

Where a BT also serves as an ORG and is installed within a building or alternative location, the BT must comply with the same provisions as a regular ORG in an alternate location.



A boundary trap may also serve as an overflow relief gully provided:



Boundary trap (BT) and Inspection shaft (IS) termination

BTs and ISs that are installed in open air must terminate as follows:

Where an inspection shaft or boundary trap riser is located clear of a building, does not terminate to a ground vent, and is not likely to be damaged by vehicular traffic, a light cover must be installed (VIC C2D4(1)(a))

Where a shaft is subject to vehicular traffic a heavy-duty trafficable cover must be installed at finished surface level.

Shaft must be fitted with an airtight cap immediately below the cover

In either case

Cover must be supported independent of the shaft so that no load is applied to the shaft

Risers must be installed vertically with no offsets

Practitioner Education Series



Boundary trap (BT) and Inspection shaft (IS) termination

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Cover must be supported independent of the shaft so that no load is applied to the shaft

Risers must be installed vertically with no offsets

In either case





Gullies



Gullies: general

Disconnecter gully

Is installed internal* or external to the building to provide disconnection between waste discharges and the sanitary drainage system.

Overflow relief gully

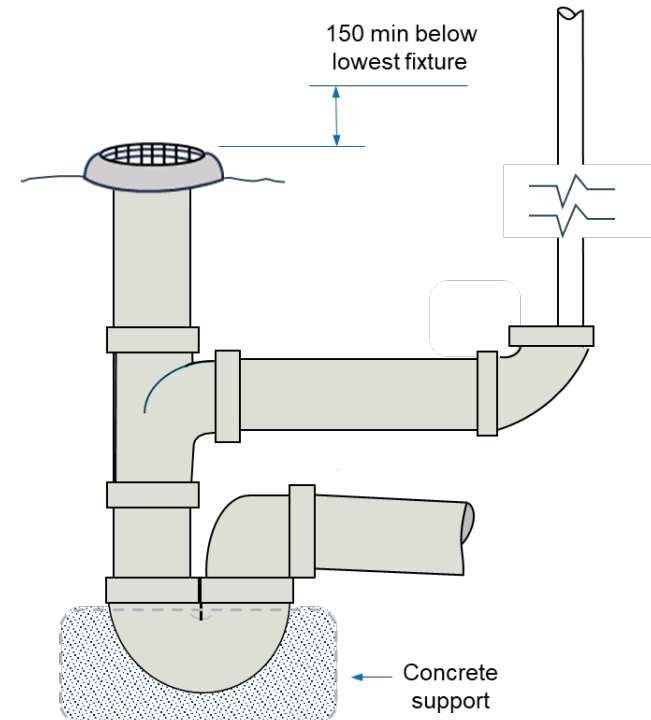
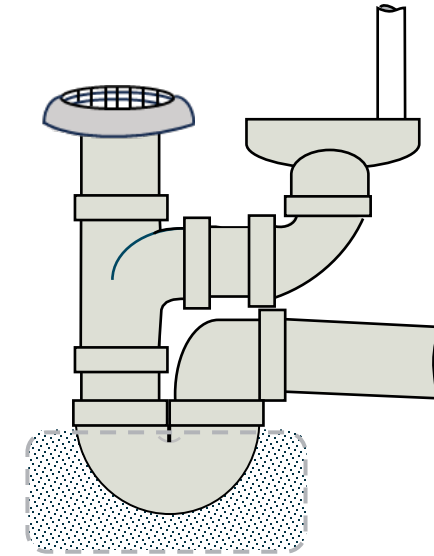
Is installed internal* or external to the building as provision for relief from sewer surcharge from the reticulated sewer.

NOTE: gullies must have risers installed vertically with no offsets. (PCA 2022 VIC C2D4(1)(b))

Floor waste gully

Is considered a fixture trap and must be installed inside a building and finished at surface level with an accessible removable grate.

*relevant provisions must be met





Overflow relief gullies: locations

The ORG shall be located:

Within the property served

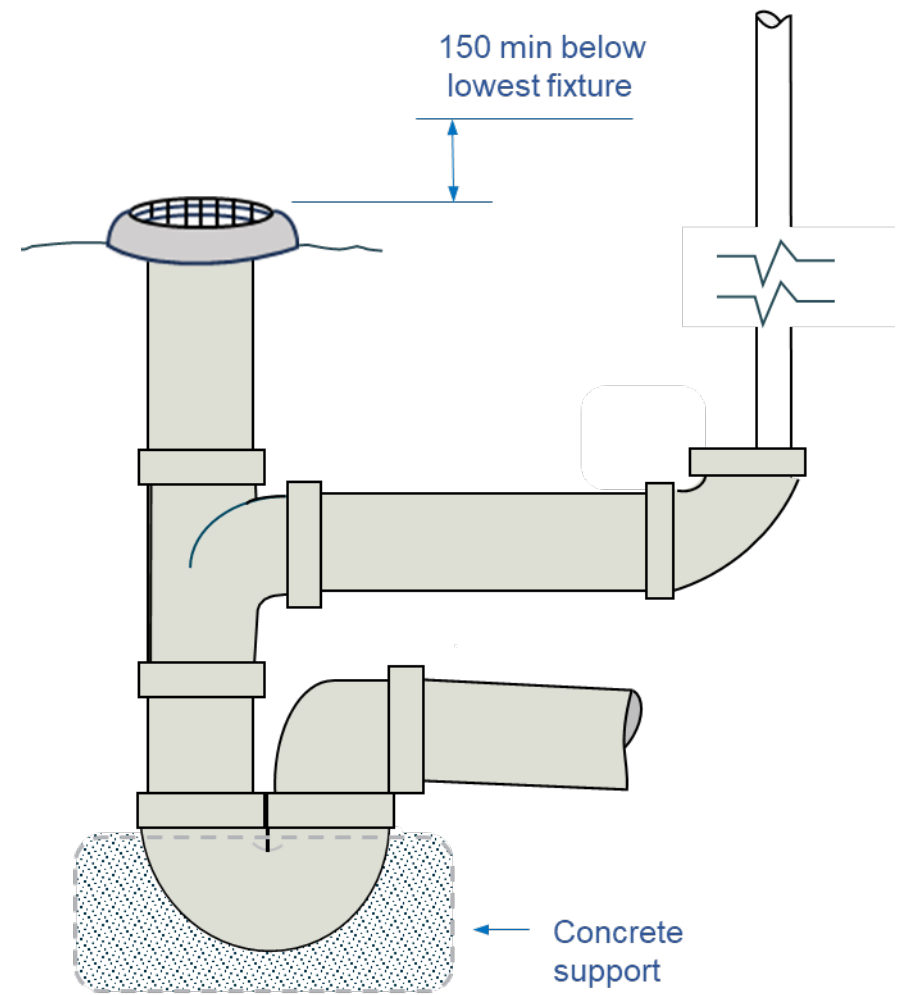
External to the building*

Where the discharge is noticeable

With more than 2m clear access above the grate

NOTE: Risers from gullies must extend vertically from the water seal without being offset

*provisions for alternative locations may apply



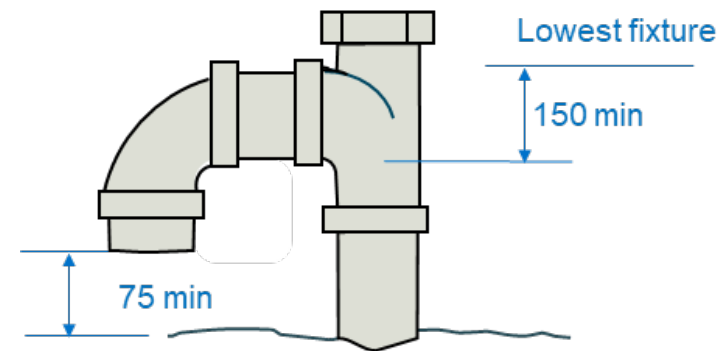
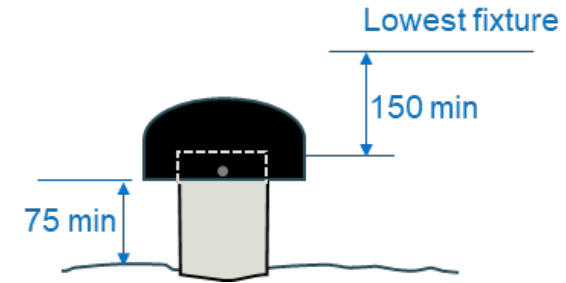
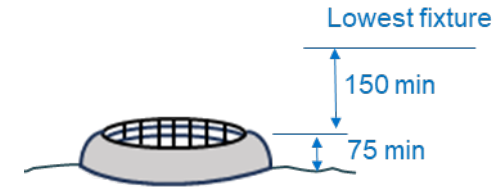
Overflow relief gullies: height of overflow

At least one overflow relief gully (ORG) must be installed in each drain*.

Additional gullies are recommended where a lower building may be affected by surcharge from a higher building.

*may be omitted if other relevant provisions are met

The ORG overflow height must be a minimum 150mm below the lowest fixture connected to the drain.





Overflow relief gullies: height of overflow

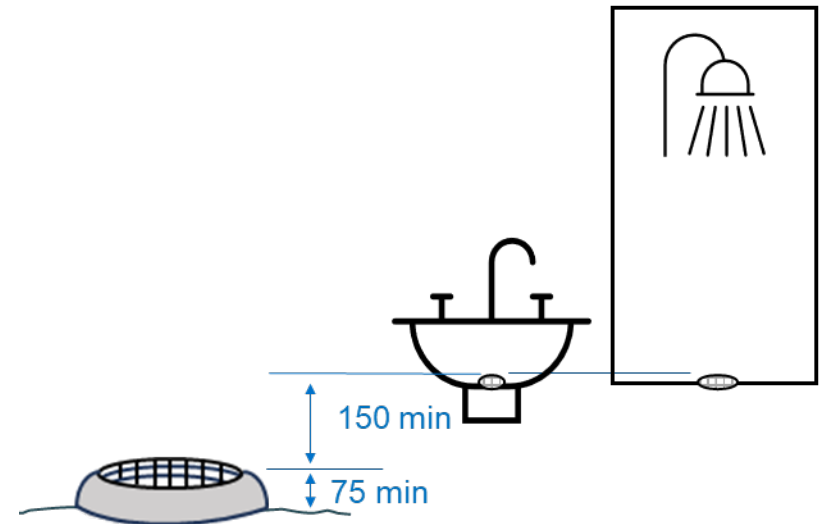
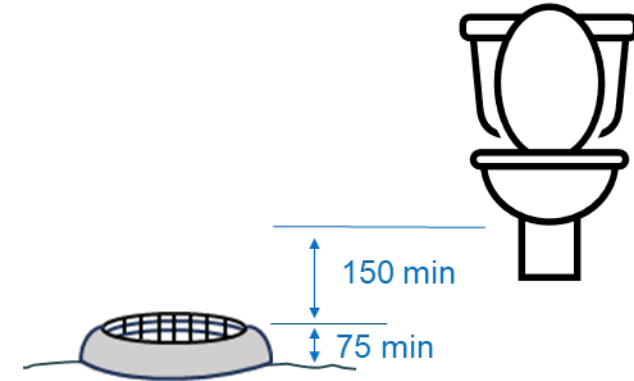
In a typical class 1 dwelling the separation height is measured between the spill level of the ORG riser and the following:

For a water closet pan, the top of the water seal

For a floor waste gully or shower, surface level of the grate

For other fixtures, surface level of the outlet

The spill level of the ORG riser must be 75mm above ground level or if installed in a paved area, finished at a level that will prevent water ingress.



Where it is not possible to locate the ORG outside the building the standard provides for the ORG to be located inside the building, provided:

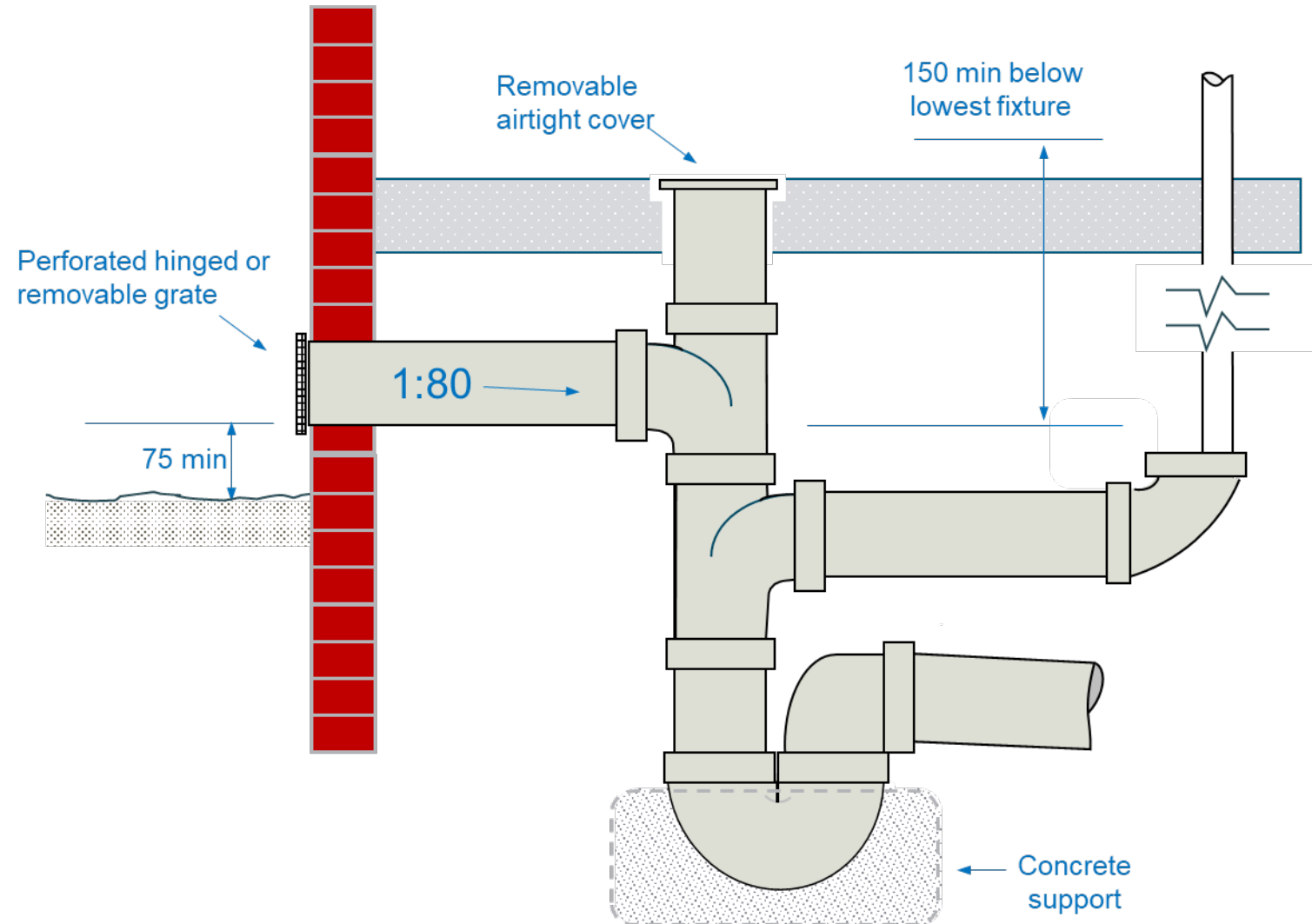
the gully riser is raised to floor level and sealed with a removable airtight cover

the riser has an equally sized overflow pipe connected above the water seal

the overflow pipe discharges in open air at an outside wall

the overflow pipe must be graded at not less than 1:80 towards the riser

no fixture connections are permitted to the overflow pipe

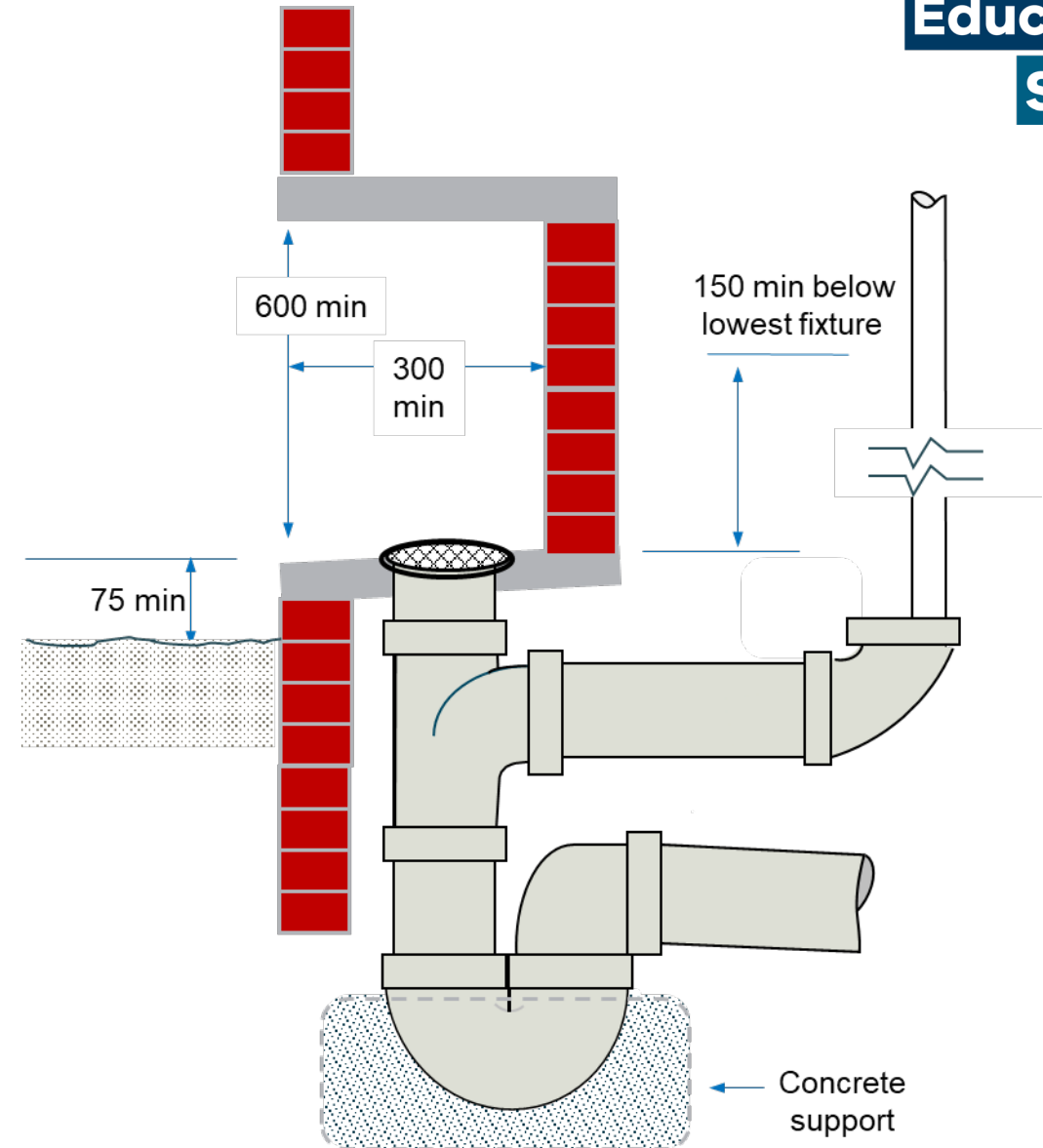


The second option is to locate the ORG in a recess on the outside the building provided:

the recess is not smaller than 300mm wide and 600mm high

the base of the recess is graded away from the building

the riser is not more than 300mm from the face of the building and is fully accessible



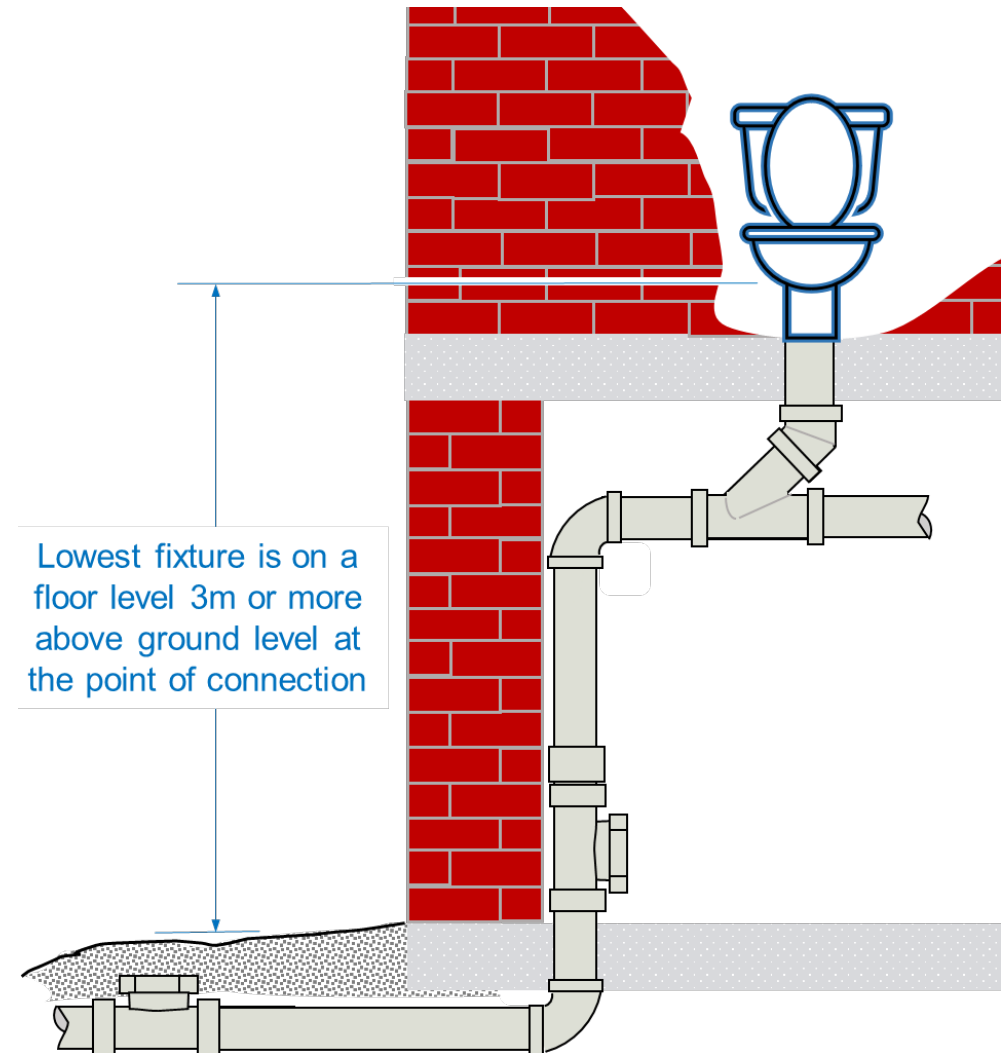
An overflow relief gully may be omitted in the following situations:

the site is entirely built on and it is not possible to locate the gully in an acceptable location, and;

the ground floor fixtures discharge through a reflux valve

the lowest fixture connected to the drain is at least 3m above ground surface level at the point of connection

the drain serves toilets or amenities in a park or reserve, the floor of which is graded towards an external door



Reflux valves



Reflux valves

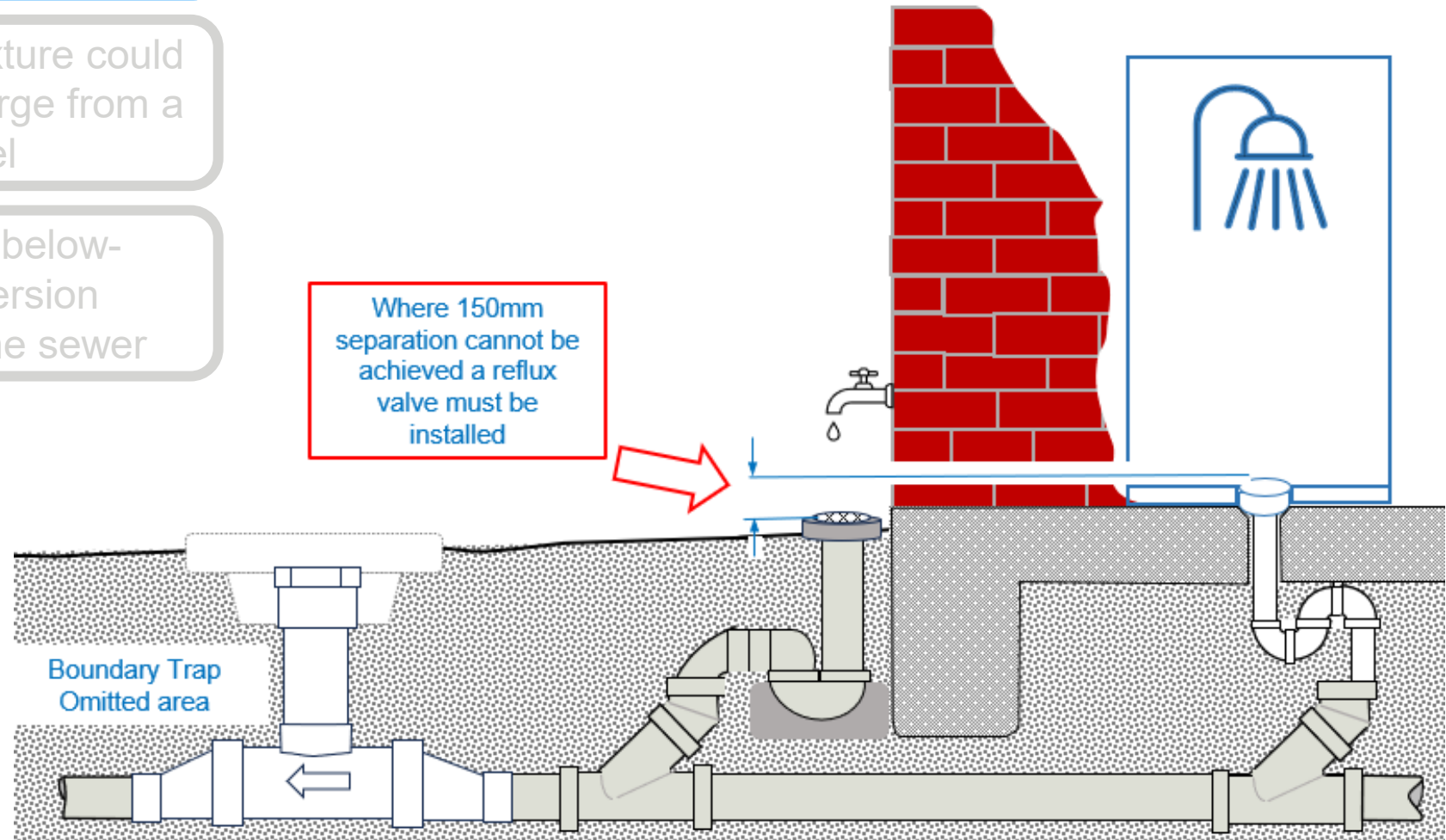
Must be installed

When the spill level of the ORG is less than 150mm below the lowest fixture

Where a basement fixture could be affected by surcharge from a fixture at a higher level

Where drainage from below-ground greywater diversion device gravitates to the sewer

Note: in known surcharge areas the Water Authority's conditions of consent may require a reflux valve to be installed.



Where 150mm separation cannot be achieved a reflux valve must be installed

Boundary Trap Omitted area

Reflux valves

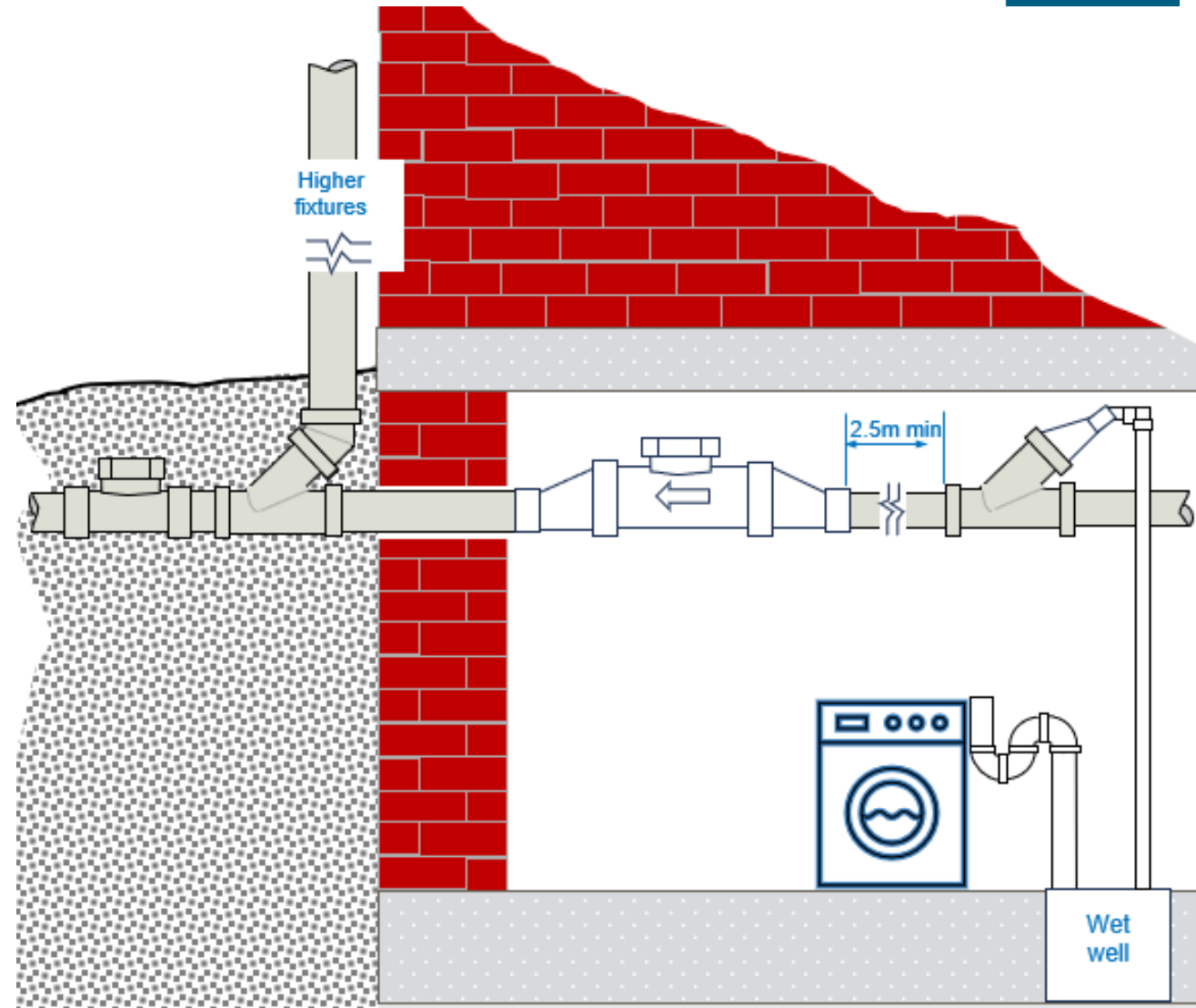
Must be installed

When the spill level of the ORG is less than 150mm below the lowest fixture

Where a basement fixture could be affected by surcharge from a fixture at a higher level

Where drainage from below-ground greywater diversion device gravitates to the sewer

Note: in known surcharge areas the Water Authority's conditions of consent may require a reflux valve to be installed.





Quick quiz

When MUST a reflux valve be installed?

- a) When the spill level of the ORG is less than 150mm below the lowest fixture
- b) Where a basement fixture could be affected by surcharge from a fixture at a higher level
- c) Where drainage from below-ground greywater diversion device gravitates to the sewer
- d) In a know surcharge area
- e) All of the above





Quick quiz

When **MUST** a reflux valve be installed?

e) All of the above



Reflux valves: where they must be installed

Where a reflux valve is installed as protection against sewer surcharge it must be located:

Immediately downstream of a boundary trap

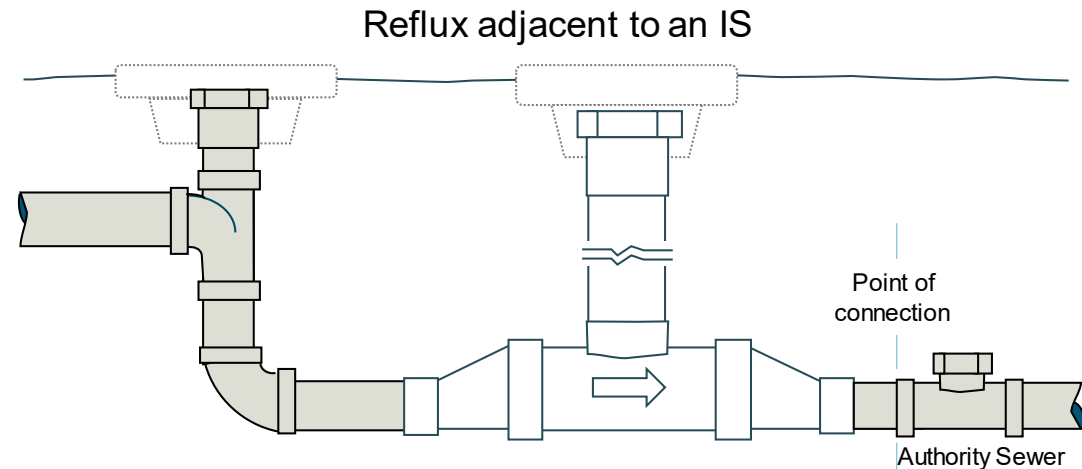
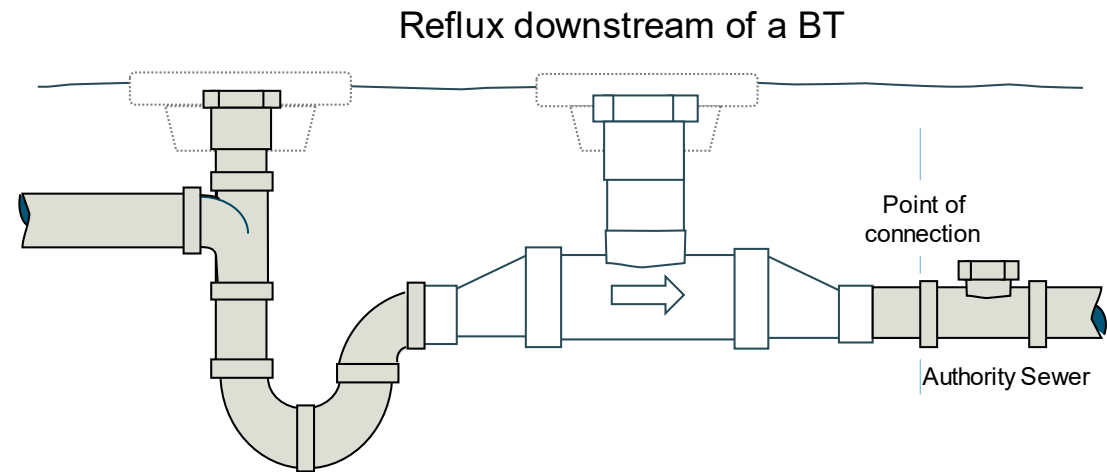
Adjacent to the inspection shaft in a boundary trap omitted area (could be upstream of IS)

Reflux valves must be maintainable from their installed position, this could be:

Installed above ground

Installed in a reflux chamber, or;

Able to be maintained from finished surface level





Inspection openings requirements

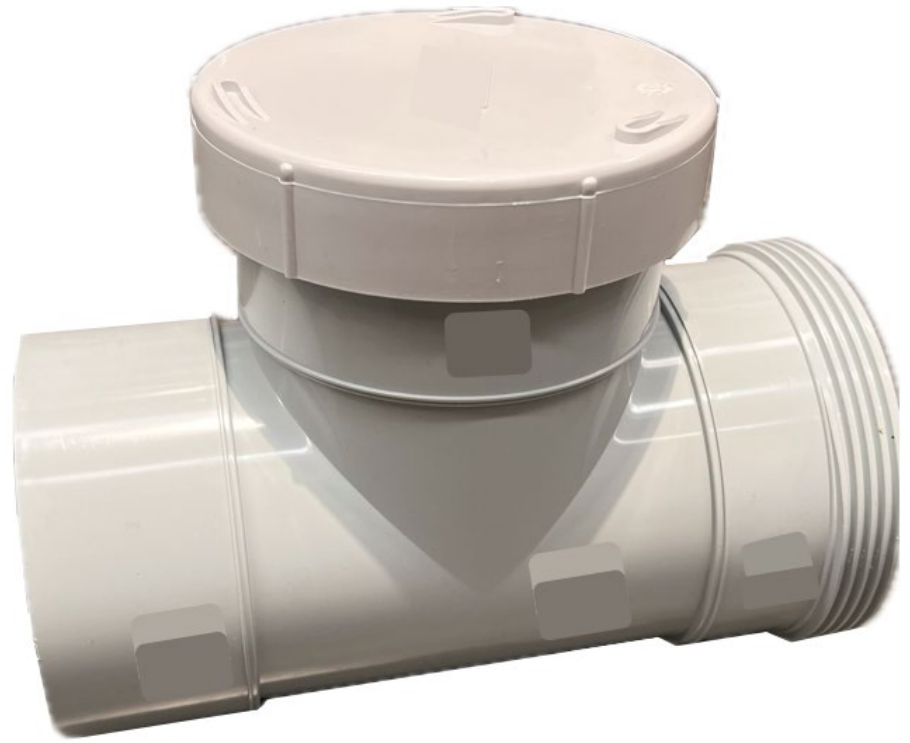
Outside of a building

- Within 2.5 m of a building on each branch connecting a WC
- At intervals of not more than 30 m
- At the point of connection
- At or immediately upstream of a jump-up lead off connection
- Where a new section of drain connects to an existing drain

At least one inspection opening must be raised to, or just below, ground level on each main drain,

This could be:

- An inspection chamber
- An inspection shaft
- A jump up riser
- A boundary trap riser
- A reflux valve riser





Junctions in drains





Junctions in the vertical plane

Junctions installed in the vertical plane can be used to connect:

drains at different elevations

a single discharge pipe

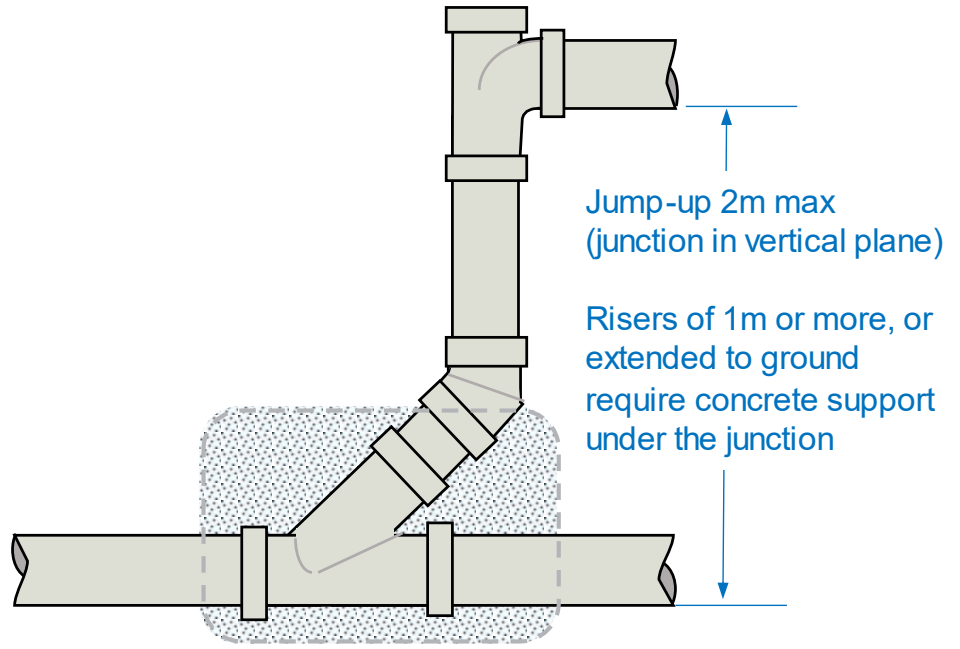
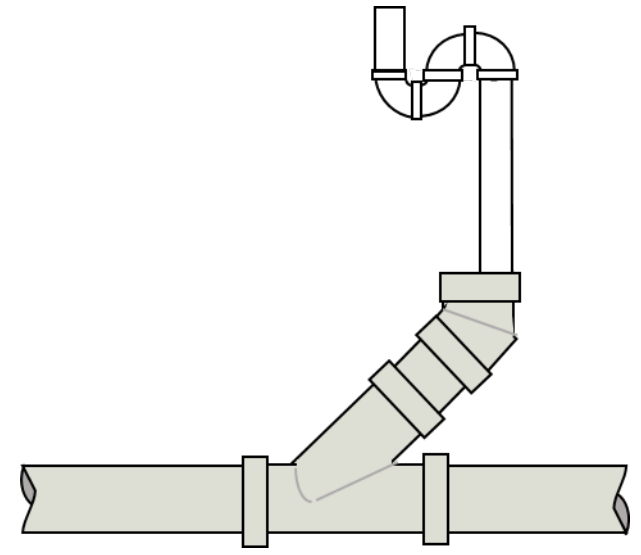
a jump-up

The following restrictions apply to junctions installed in the vertical plane:

Riser must not exceed 2m from graded drain invert

Must not be used to connect a stack below ground

Junction must be supported on concrete if riser exceeds 1m or is raised to ground



Construction of a jump-up

A jump-up can be constructed with a **bend or junction** at the base

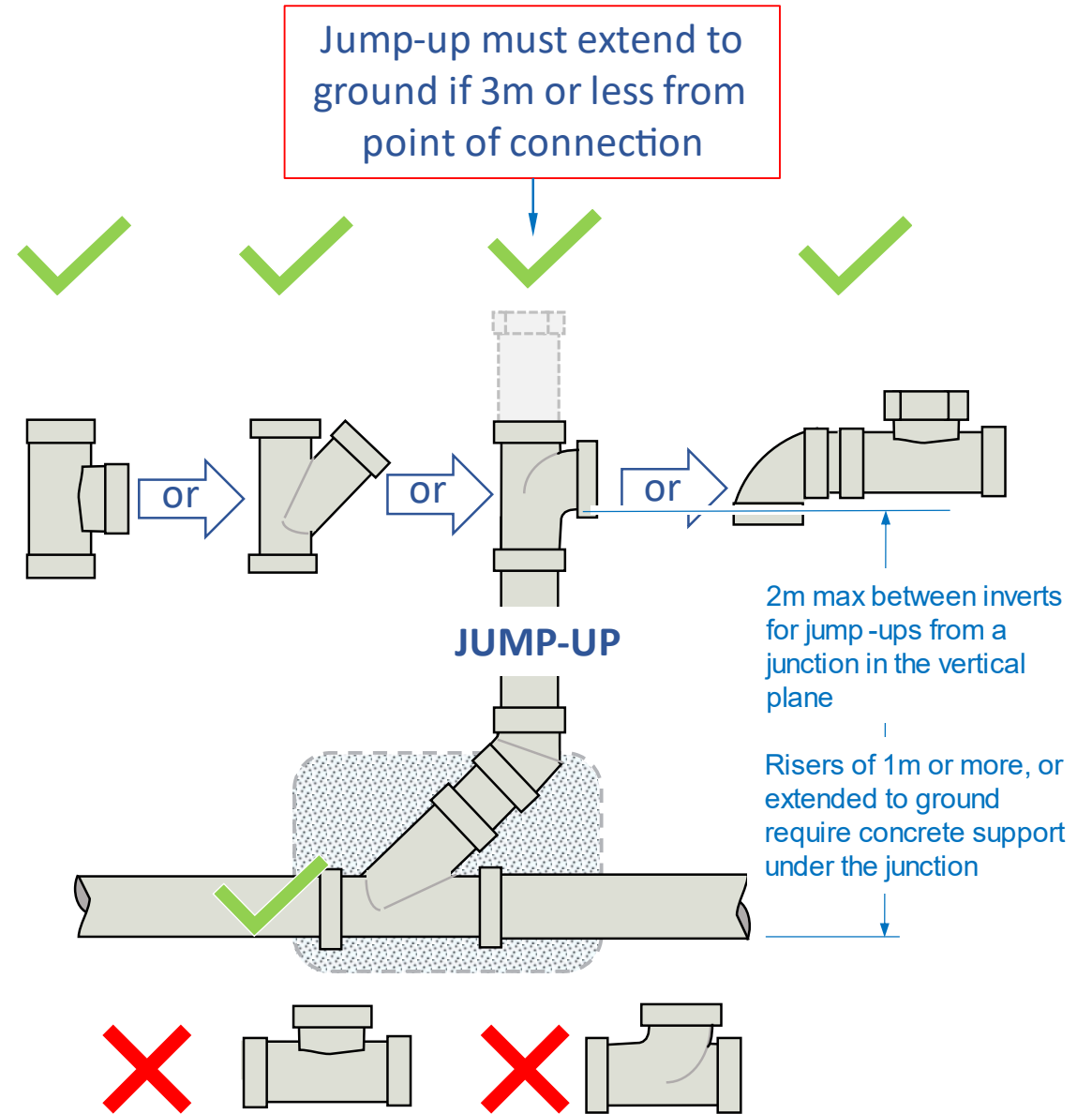
Sweep, square and 45° junctions can be used to connect into the riser shaft

A jump-up should be used:

To connect drains at different elevations

Where the full depth of the authority's point is not required

Note: jump-ups within 3m of the point of connection **must** be raised to ground level.





Inspection Shaft Jump Up (ISJU)



Jump-ups with an inspection shaft extended to ground

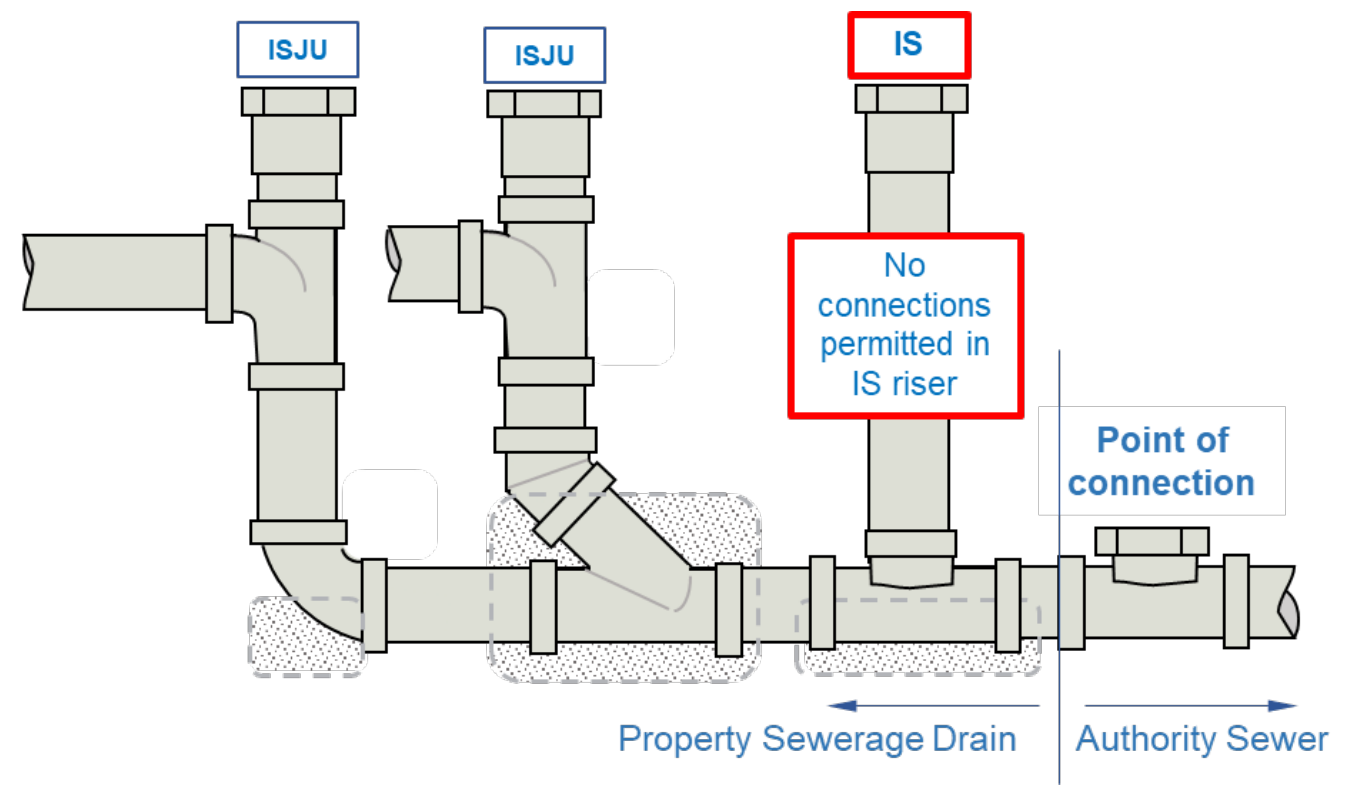
Inspection Shafts (ISs)



are constructed with a square junction at the base



no connections are permitted in the IS riser shaft



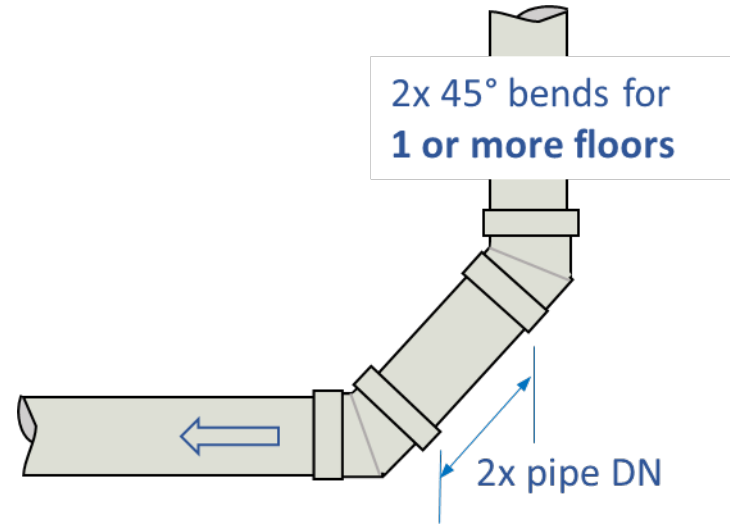
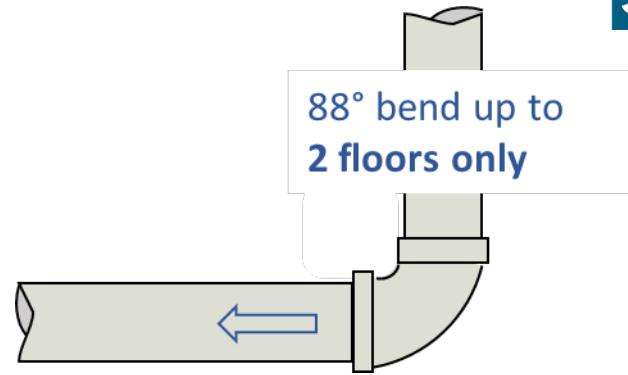


Connection of stack below ground

Stacks connecting to below ground drains shall connect by

An **88° bend**, if the stack extends through **not more than 2 floors**; or

Two **45° bends** separated by a straight length of pipe, which is not shorter than twice the diameter of the pipe



Connection of stack below ground

Where the stack connects through a junction the junction shall be a 45° junction on grade and;

An 88° bend, if the stack extends through **not more than 2 floors**; or

Two 45° bends separated by a straight length of pipe, which is not shorter than twice the diameter of the pipe



NOTE: where the stack and main drain are unequal sizes, the change in size must be made above ground using a taper fitting.



88° bend up to 2 floors only



2 x Pipe DN

2x 45° bends for 1 or more floors



Junctions on grade

Where a graded drain is connected to any other graded drain the connection must be made using a junction with an upstream angle not greater than 45°

88° and square junctions are not permitted for this purpose





New requirement for junctions in drains

On 26 September 2023 changes to the Plumbing Regulations 2018 adopted the 2021 edition of the AS/NZS 3500 series as part of the deemed-to-satisfy requirements for compliance with the Plumbing Code of Australia.

For below ground drains the most significant change is:

Where a 100mm junction connects a 100mm branch pipe to another 100mm pipe, the entry level of the branch pipe must be rotated to 15° above the horizontal



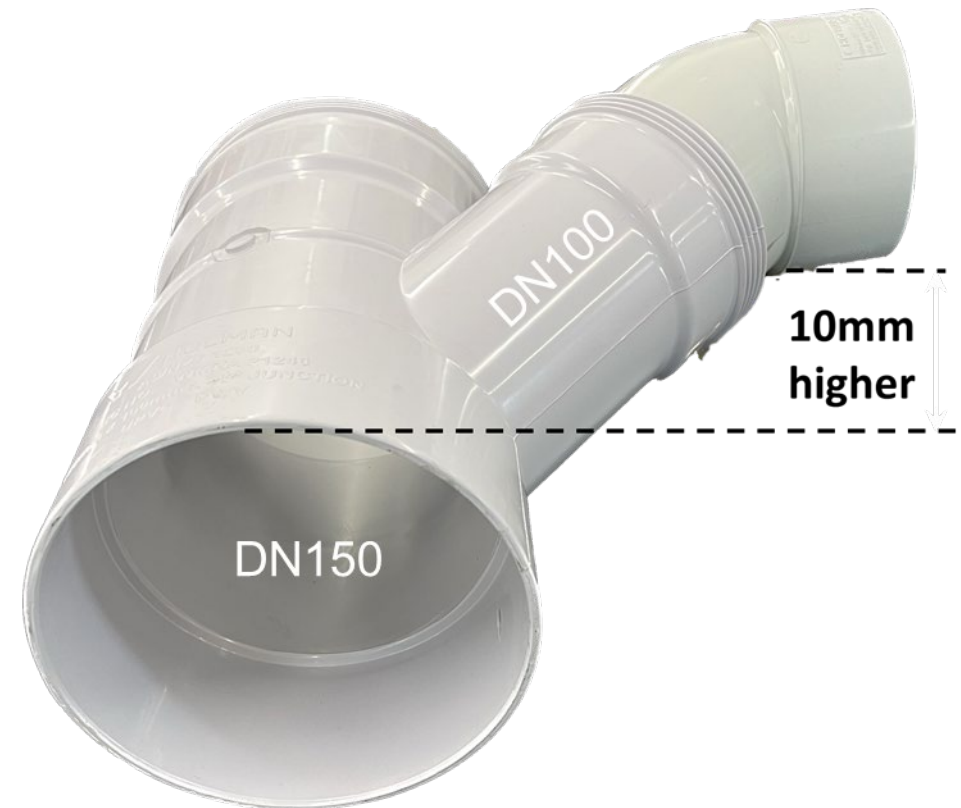
NOTE This requirement applies to drains in all classes of buildings.
The drain can revert to grade upstream of the junction.



Where an unequal junction is used to connect a branch drain to another drain, the invert of the branch drain must be at least 10mm higher than the soffit of the drain to which it connects.

Unequal junctions must not be used to connect a stack.

Where a stack riser has a smaller DN than the below ground drain, an **equal** junction must be used with the transition in size made above ground using a taper fitting.



Quick quiz

A stack can be connected to a below ground drain by an unequal junction, TRUE OR FALSE?

- a) TRUE, if the junction is rolled up by 15°
- b) TRUE, if the soffit is 10mm higher than the soffit of the drain to which it connects
- c) FALSE, an unequal junction cannot connect a stack to a below ground drain



Quick quiz

A stack can be connected to a below ground drain by an unequal junction, TRUE OR FALSE?

c) FALSE, an unequal junction **cannot** connect a stack to a below ground drain.





88° and square junctions in below ground drains

88° and Square junctions can be used:

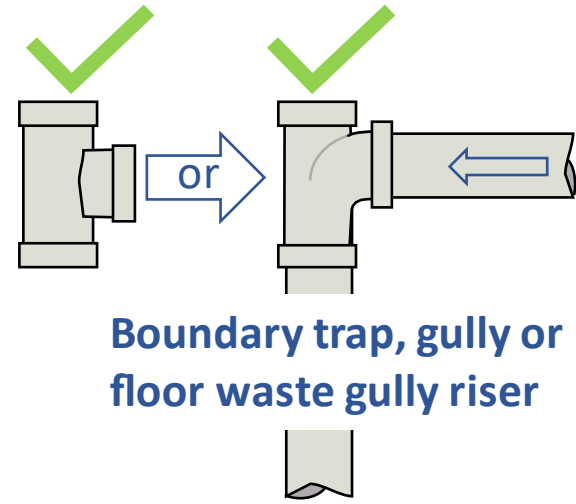
At the connection of a graded drain into a jump up or boundary trap riser

As an inlet riser to a gully or floor waste gully

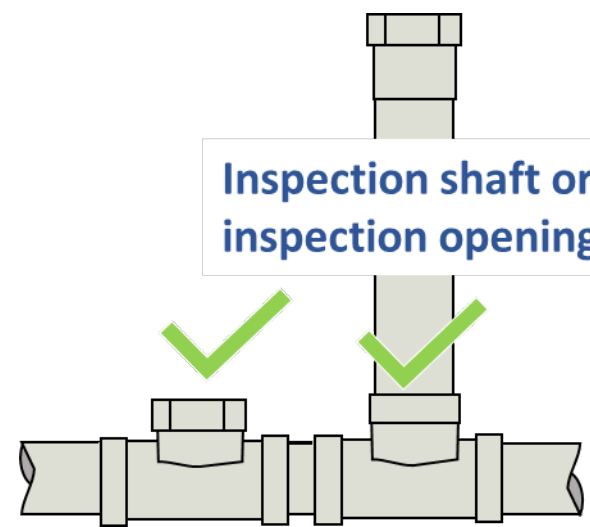
Square junctions must also be used:

To connect an inspection shaft into a graded drain

As an inspection opening



Boundary trap, gully or floor waste gully riser



Inspection shaft or inspection opening

Note: No connections are permitted in an Inspection shaft riser.

A sanitary drainage installation must avoid damage from superimposed loads or ground movement.

Clause 5.6 of AS/NZS 3500.2, also requires the methods of support and bedding of a drain to be designed to suit the ground conditions.



PN DR04
– Drains in reactive soil

Drainage DR 04 | Drainage in reactive soil

Audience

The audience/s for this Practice Note include/s:

- | | |
|--|---|
| <input checked="" type="checkbox"/> Architects/ Designers | <input checked="" type="checkbox"/> Owner Builders |
| <input checked="" type="checkbox"/> Builders | <input checked="" type="checkbox"/> Plumbers |
| <input checked="" type="checkbox"/> Building Surveyors/ Inspectors | <input type="checkbox"/> Real estate management agents |
| <input checked="" type="checkbox"/> Engineers | <input type="checkbox"/> Trades and Maintenance (inc. Electricians) |
| <input type="checkbox"/> Home Owners / Residential Tenants | |

Purpose

This Practice Note provides guidance on drainage installation in reactive soil, unstable and water charged ground to meet the requirements of AS/NZS 3500.2 – Clause 5.6.

The content below provides guidance on:

- Drainage installations and service life
- NCC 2022 Volume 3 Plumbing Code of Australia (PCA) Requirements
- Determining soil conditions
- Sites requiring special drainage designs
- Steps to follow when laying the drain
- Drainage Inspections



For guidance on the plumbing regulatory framework, refer to Plumbing Practice note RF 01 Regulatory Framework Plumbing NCC

Abbreviations & Definitions

The abbreviations and definitions set out below are for guidance only. They are not intended to vary those set out in the Building Act 1993, Plumbing Regulations 2018, or the National Construction Code.

- **AS** – Australian Standard
- **ABCB** - Australia Building Codes Board
- **AS/NZS** – Australian/ New Zealand Standard
- **NCC** – National Construction Code
- **PCA** – Plumbing Code of Australia

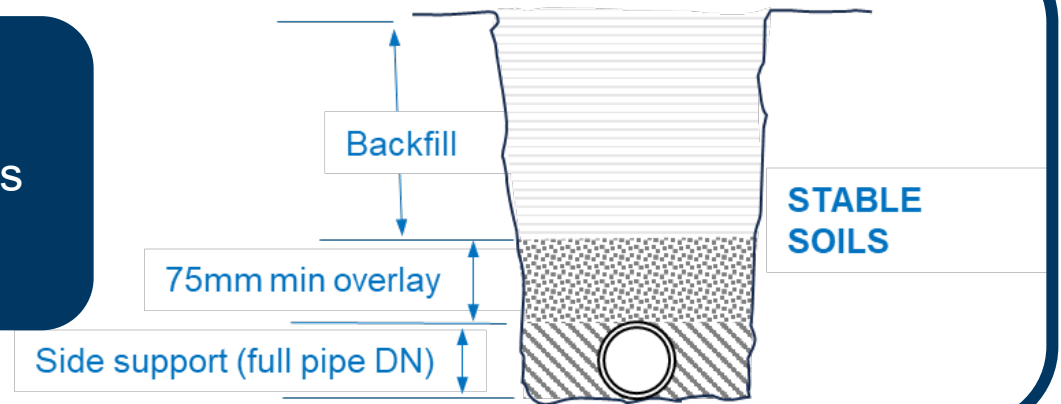
Bedding of drains – trench base, side support and overlay

Stable soils
(2 options)

MAY BE LAID

OR MAY BE LAID

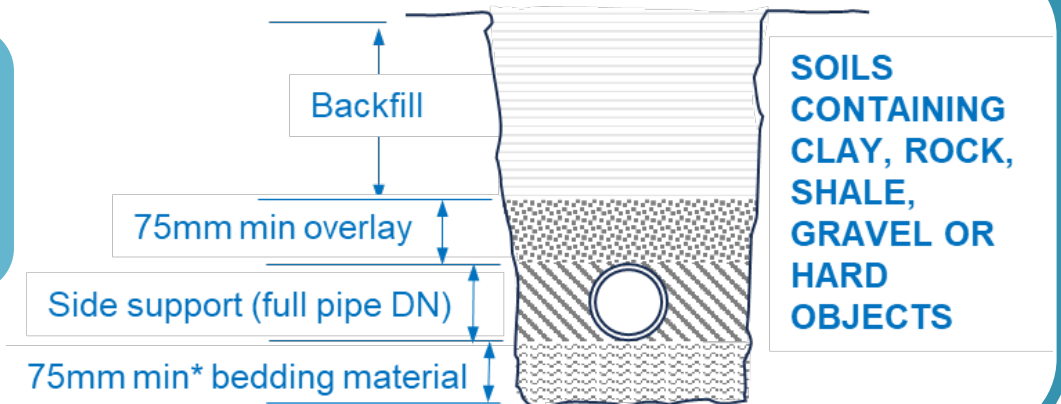
on the undisturbed base of the trench, provided the trench is free from rocks and tree roots



Soils containing clay, rock, shale, gravel or hard objects
(1 option)

MUST BE LAID

on an appropriate bedding material



Bedding of drains: Materials

Materials used for bedding or filling must be one of the following:

Crushed rock, gravel screenings or similar recycled materials sized between 7mm and 10mm (quarter minus is acceptable, provided it is consistent in size upon visual inspection)

Free running sand, excavated from the trench, capable of passing through a 2 mm mesh sieve, which does not contain clay, organic or other deleterious materials. VICC2D4(1)(d)

Cement mortar bedding



VBA PN DR02
Bedding materials for below ground sanitary drains

Testing of drains

All new, re-used, repaired or replaced sanitary drainage installations **must be tested** to ensure that they are watertight.

Drains may be tested using any of the following test methods:

an air test

a vacuum test

a water test, using non-drinking water provided by the Network Utility Operator (VIC C2D4(1)(e))



NCC
Part C2: Sanitary drainage systems



Concrete support of drains

Concrete support of drains must be installed at:

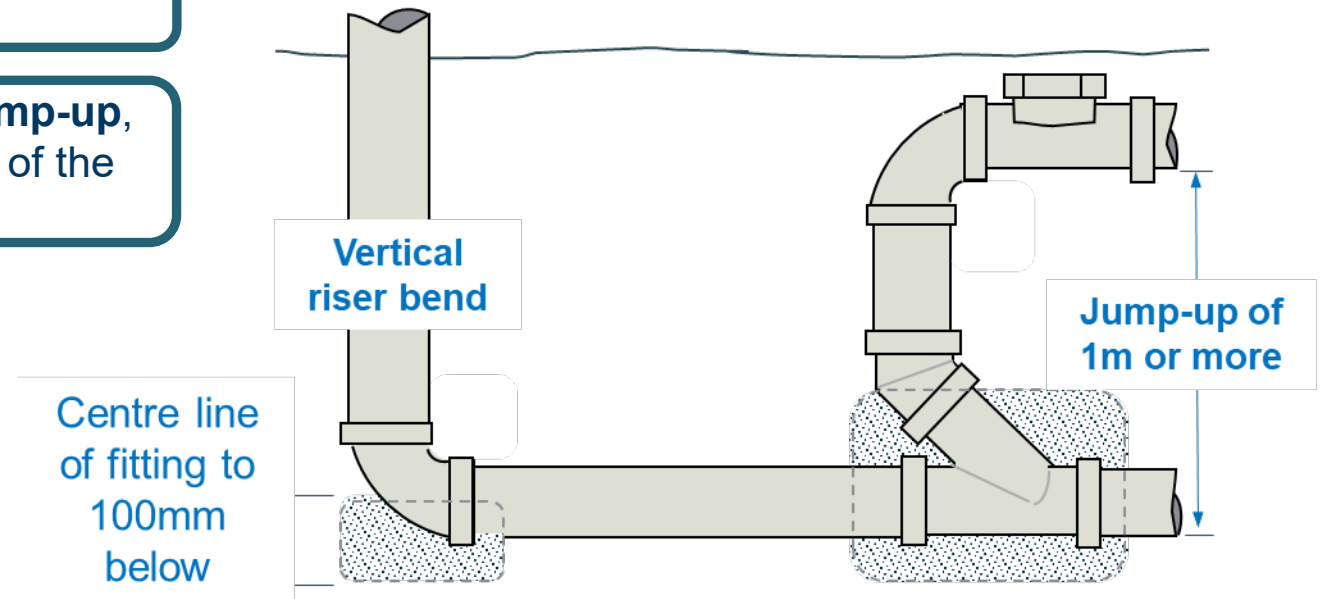
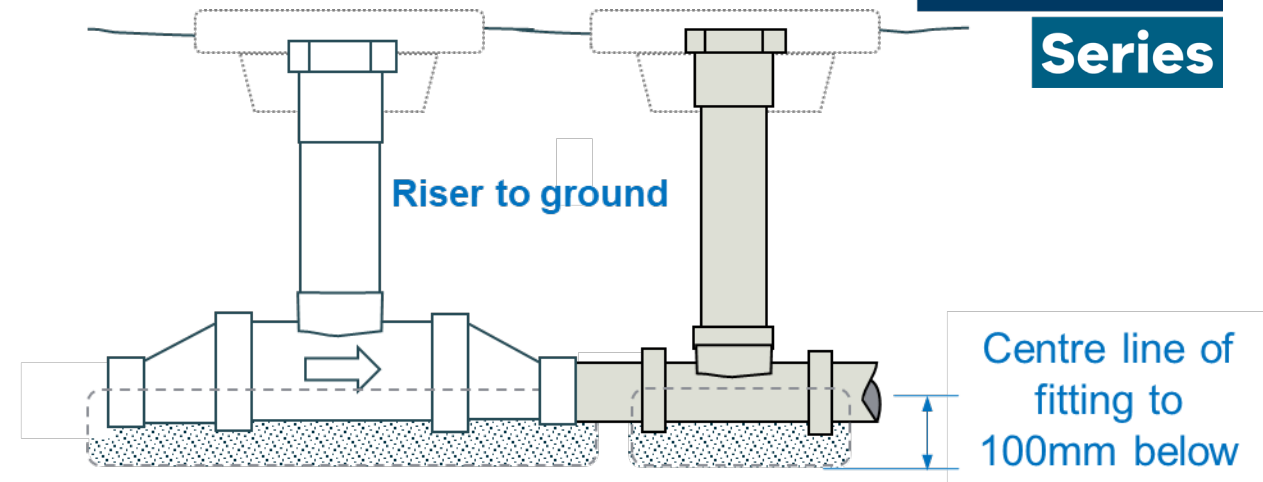
All vertical riser bends greater than DN 65 (Vic C2D4(c))

Under the junction of any riser that extends to ground level

Under the junction of any jump-up if it exceeds 1m in height

Under junctions in drains that form an **IS**, up to the centre line of the fitting*

Under junctions in drains that form a **jump-up**, continued up vertically to the underside of the bend fitted to the junction





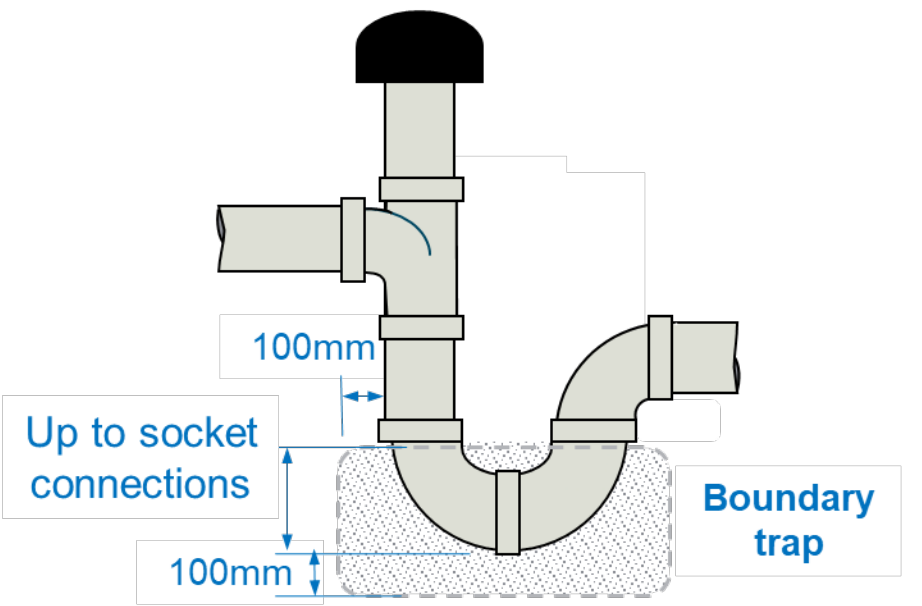
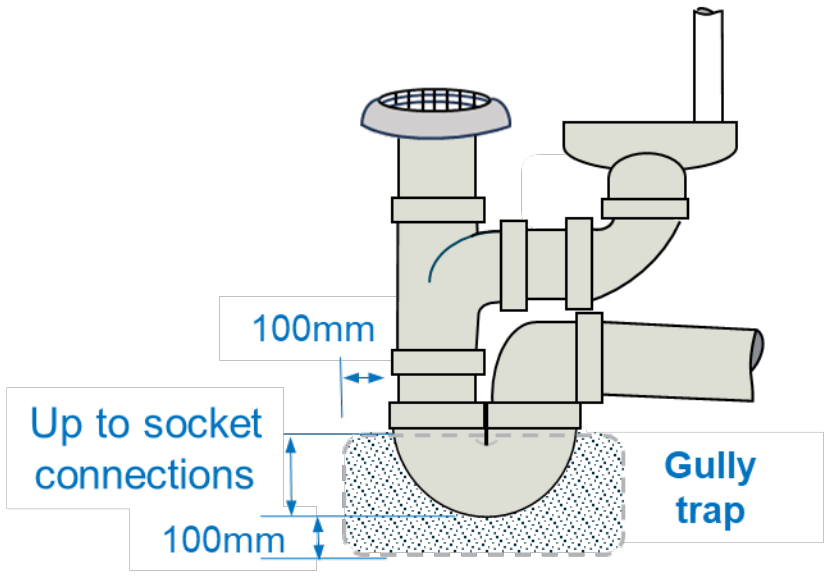
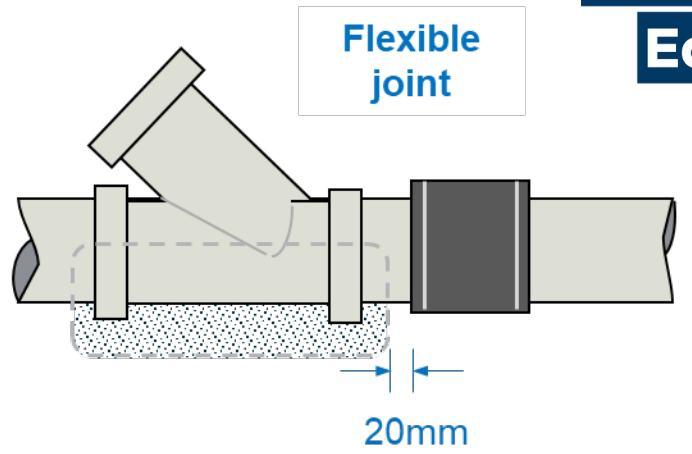
Concrete support of drains

Concrete support of drains **must be installed**

Not closer than 20mm to a flexible joint

Under and the base of a gully trap and up to the inlet socket of the trap

Under and the base of a boundary trap and up to the inlet socket of the trap





Concrete support of drains

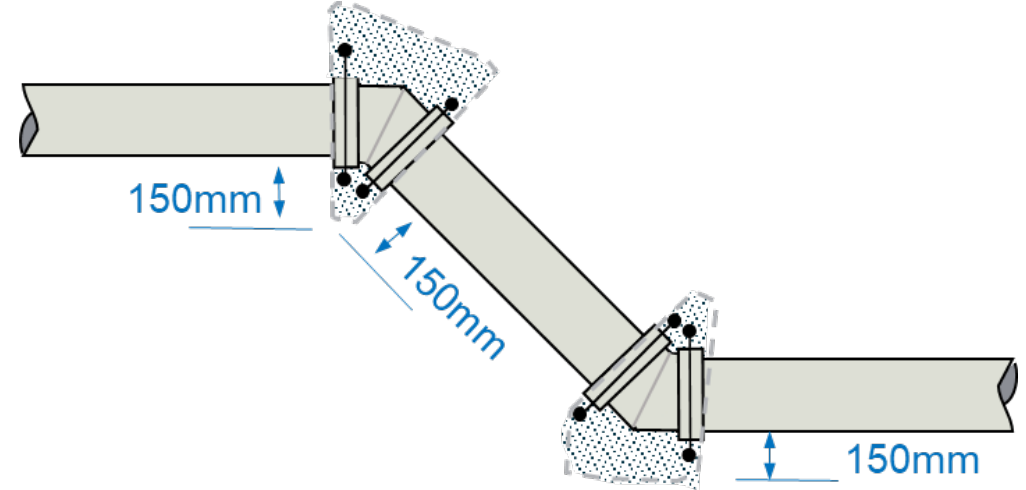
Concrete support of drains **must be installed**

Anchor blocks for drains on grades between 20% (1:5) and vertical (all drains up to DN 150)

Concrete must have a minimum characteristic compressive strength of 20 Mpa*

Water used for mixing concrete must not be harmful to the mixture, the reinforcing or anything imbedded within the concrete.

*Note: some rapid set concrete does not achieve 20Mpa



Conclusion

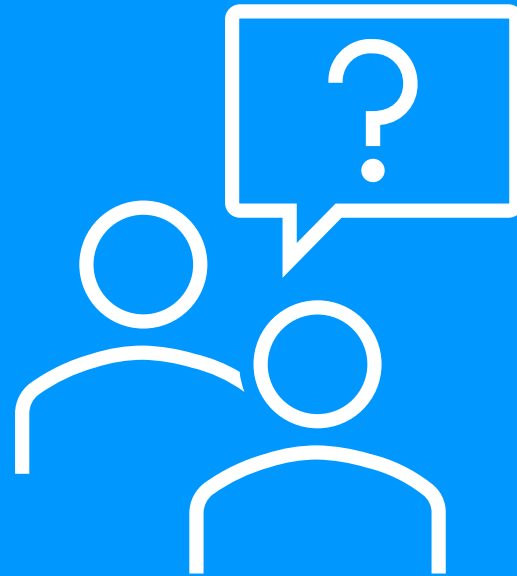
Today we have:

looked at some of the most common drainage questions:

- boundary traps,
- inspection shafts,
- overflow relief and ventilation for various types of sites



Q & A





Pre-submitted questions

Q1. What are the new 15-degree requirements for junctions in drains and are they being enforced?

Q2. Where do I have to install swivel joints?

Q3. What is Plumber responsible for, that does not fall under the Building Permit approval process ?

Q4. What are the common errors found in drainage designs?

Thank you!

After this webinar:

Later today

We'd love your feedback!

You'll receive an email with a quick survey

You'll receive your attendance certificate via email

In approximately 2 weeks

You'll receive an email with the answers to all of today's questions that we didn't get to, as well as those that we did

Practitioner

Education

Series

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