Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause

G13 Foul Water
Status of Verification Methods and Acceptable Solutions

Verification Methods and Acceptable Solutions are prepared by the Ministry of Business, Innovation and Employment in accordance with section 22 of the Building Act 2004. Verification Methods and Acceptable Solutions are for use in establishing compliance with the New Zealand Building Code.

A person who complies with a Verification Method or Acceptable Solution will be treated as having complied with the provisions of the Building Code to which the Verification Method or Acceptable Solution relates. However, using a Verification Method or Acceptable Solution is only one method of complying with the Building Code. There may be alternative ways to comply.

Users should make themselves familiar with the preface to the New Zealand Building Code Handbook, which describes the status of Verification Methods and Acceptable Solutions and explains alternative methods of achieving compliance. Defined words (italicised in the text) and classified uses are explained in Clauses A1 and A2 of the Building Code and in the Definitions at the start of this document.
Document Status
The most recent version of this document (Amendment 7), as detailed in the Document History, is approved by the Chief Executive of the Ministry of Business, Innovation and Employment. It is effective from 30 November 2018 and supersedes all previous versions of this document.

The previous version of this document (Amendment 6) will cease to have effect on 31 March 2019.

People using this document should check for amendments on a regular basis. The Ministry of Business, Innovation and Employment may amend any part of any Verification Method or Acceptable Solution at any time. Up-to-date versions of Verification Methods and Acceptable Solutions are available from www.building.govt.nz

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New Zealand Building Code
Clause G13 Foul Water

The mandatory provisions for building work are contained in the New Zealand Building Code (NZBC), which comprises the First Schedule to the Building Regulations 1992. The relevant NZBC Clause for Foul Water is G13.

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<td><strong>OBJECTIVE</strong></td>
<td>G13.1 The objective of this provision is to:</td>
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<td>(a) Safeguard people from illness due to infection or contamination resulting from personal hygiene activities; and</td>
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<td>(b) Safeguard people from loss of amenity due to the presence of unpleasant odours or the accumulation of offensive matter resulting from foul water disposal.</td>
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<td><strong>FUNCTIONAL REQUIREMENT</strong></td>
<td>G13.2 Buildings in which sanitary fixtures and sanitary appliances using water-borne waste disposal are installed must be provided with—</td>
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<td>(a) an adequate plumbing and draining system to carry foul water to appropriate outfalls; and</td>
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<td>(b) if no sewer is available, an adequate system for the storage, treatment, and disposal of foul water.</td>
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<td><strong>PERFORMANCE</strong></td>
<td>G13.3.1 The plumbing system shall be constructed to:</td>
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<td>(a) Convey foul water from buildings to a drainage system,</td>
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<td>(b) Avoid the likelihood of blockage and leakage,</td>
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<tr>
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<td>(c) Avoid the likelihood of foul air and gases entering buildings, and</td>
</tr>
<tr>
<td></td>
<td>(d) provide reasonable access for maintenance and clearing blockages.</td>
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<tr>
<td></td>
<td>G13.3.2 The drainage system shall:</td>
</tr>
<tr>
<td></td>
<td>(a) Convey foul water to an appropriate outfall,</td>
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<td>(b) Be constructed to avoid the likelihood of blockage,</td>
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### Clause G13—FOUL WATER

**Provisions**

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<td>(c) Be supported, jointed and protected in a way that will avoid the likelihood of penetration of roots or the entry of ground water,</td>
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<tr>
<td>(d) Be provided with reasonable access for maintenance and clearance blockages,</td>
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<tr>
<td>(e) Be ventilated to avoid the likelihood of foul air and gases accumulating in the drainage system and sewer, and</td>
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<tr>
<td>(f) Be constructed to avoid the likelihood of damage from superimposed loads or normal ground movement.</td>
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**G13.3.3** Where a sewer connection is available, the drainage system shall be connected to the sewer, and the connection shall be made in a manner that avoids damage to the sewer and is to the approval of the network utility operator.

**G13.3.4** If no sewer is available, facilities for the storage, treatment, and disposal of foul water must be constructed—

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<td>(a) with adequate capacity for the volume of foul water and the frequency of disposal; and</td>
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<tr>
<td>(b) with adequate vehicle access for collection if required; and</td>
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<tr>
<td>(c) to avoid the likelihood of contamination of any potable water supplies in compliance with Clause G12 “Water supplies”; and</td>
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<tr>
<td>(d) to avoid the likelihood of contamination of soils, ground water, and waterways except as permitted under the Resource Management Act 1991; and</td>
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Provisions

(e) from materials that are imper- 
vious both to the foul water 
for which disposal is required, 
and to water; and
(f) to avoid the likelihood of 
blockage and leakage; and
(g) to avoid the likelihood of foul 
air and gases accumulating 
within or entering into buildings; and
(h) to avoid the likelihood of 
unauthorised access by 
people; and
(i) to permit easy cleaning and 
maintenance; and
(j) to avoid the likelihood of 
damage from superimposed 
loads or normal ground move- 
ment; and
(k) if those facilities are buried 
underground, to resist hydro- 
static uplift pressures.

Limits on application
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**FOUL WATER**

DEPARTMENT OF BUILDING AND HOUSING

23 June 2007

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For the purposes of New Zealand Building Code (NZBC) compliance, the Standards and documents referenced in these Verification Methods and Acceptable Solutions (primary reference documents) must be the editions, along with their specific amendments, listed below. Where these primary reference documents refer to other Standards or documents (secondary reference documents), which in turn may also refer to other Standards or documents, and so on (lower-order reference documents), then the version in effect at the date of publication of these Verification Methods and Acceptable Solutions must be used.

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Definitions

This is an abbreviated list of definitions for the words or terms particularly relevant to these Verification Methods and Acceptable Solutions. The definitions for any other italicised words may be found in the New Zealand Building Code Handbook.

Access chamber A chamber with working space at drain level through which the drain passes either as an open channel or as a pipe incorporating an inspection point.

Access point A place where access may be made to a drain or discharge pipe for inspection, cleaning or maintenance; and may include a cleaning eye, inspection point, rodding point, inspection chamber or access chamber.

Adequate Adequate to achieve the objectives of the building code.

Air admittance valve A valve that allows air to enter but not to escape in order to limit pressure fluctuations within the sanitary plumbing or drainage system.

Branch discharge pipe A discharge pipe that serves one or more fixture discharge pipes for any one floor.

Branch vent pipe A vent pipe that serves two or more fixture vent pipes.

Building has the meaning ascribed to it by Sections 8 and 9 of the Building Act 2004.

Cleaning eye A small diameter access point usually formed as part of a fitting or trap.

Combined waste pipe A discharge pipe which serves two or more waste pipes.

Developed length The total length along the centre line of a pipe including fittings and bends.

Diameter (or bore) The nominal internal diameter.

Discharge pipe Any pipe that is intended to convey discharge from sanitary fixtures or sanitary appliances.

Discharge stack A discharge pipe that has one or more discharge pipe connections, and which is vented at one end via a discharge stack vent.

Discharge stack vent A vent pipe connected to the top of the discharge stack.

Discharge unit The unit of measure for the discharge (hydraulic load) in the plumbing system, and is based on the rate, duration and frequency of discharge from a sanitary fixture or sanitary appliance.

Drain A pipe normally laid below ground level including fittings and equipment and intended to convey foul water or surface water to an outfall.

Drain vent pipe Any pipe which is intended to permit the movement of air into and out of the drain and sewer.

Fixture An article intended to remain permanently attached to and form part of a building.

Fixture discharge pipe A discharge pipe that is used to convey waste from a single sanitary fixture or sanitary appliance to a branch discharge pipe, a discharge stack, or directly to a drain. It does not include any pipes forming part of a sanitary appliance.

Fixture vent pipe (trap vent) A vent pipe that is connected to a fixture discharge pipe or the sanitary fixture itself.

Floor waste An outlet located at the low point of a graded floor or in a level floor designed to receive accidental or intentional discharges.

Floor waste pipe A pipe that receives the discharge from a floor waste and that discharges outside the building or to the foul water drainage or sanitary plumbing system.

Foul water The discharge from any sanitary fixture or sanitary appliance.

Foul water drainage system Drains, joints and fittings normally laid underground and used specifically for the conveyance of water from the plumbing system to an outfall.

Grease trap A device designed to intercept grease in a foul water discharge.
Gully trap A fitting designed to prevent foul air escaping from the drainage system and used to receive the discharge from waste pipes.

Inspection chamber A chamber with working space at ground level through which the drain passes either as an open channel or as a pipe incorporating an inspection point.

Inspection point A removable cap at drain level through which access may be made for cleaning and inspecting the drainage system.

Network utility operator means a person who—

a) undertakes or proposes to undertake the distribution or transmission by pipeline of natural or manufactured gas, petroleum, biofuel, or geothermal energy; or

b) operates or proposes to operate a network for the purpose of—

i) telecommunication as defined in section 5 of the Telecommunications Act 2001; or

ii) radiocommunications as defined in section 2(1) of the Radiocommunications Act 1989; or

c) is an electricity operator or electricity distributor as defined in section 2 of the Electricity Act 1992 for the purpose of line function services as defined in that section; or

d) undertakes or proposes to undertake the distribution of water for supply (including irrigation); or

e) undertakes or proposes to undertake a drainage or sewerage system.

Outfall That part of the disposal system receiving surface water or foul water from the drainage system. For foul water, the outfall may include a sewer or a septic tank. For surface water, the outfall may include a natural water course, kerb and channel, or soakage system.

Plumbing system Pipes, joints and fittings, laid above ground and used for the conveyance of foul water to the foul water drain and includes vent pipes.

Relief vent A vent pipe which is connected to a discharge stack below the lowest branch connection and which connects at its upper end to the discharge stack vent or terminates as an open vent.

Roddling point A removable cap at ground level through which access may be made for cleaning and inspecting the drainage system.

Sanitary appliance An appliance which is intended to be used for sanitation and which is not a sanitary fixture. Included are machines for washing dishes and clothes.

Sanitary fixture Any fixture which is intended to be used for sanitation.

Sanitation The term used to describe the activities of washing and/or excretion carried out in a manner or condition, such that the effect on health is minimised, with regard to dirt, contamination and infection.

Sewer A drain that is under the control of, or maintained by, a network utility operator.

Soil fixture A sanitary fixture constructed to receive solid and/or liquid excreted human waste. It includes bedpan disposal units, slop sinks, urinals, water closet pans, and water-flushed sanitary towel disposal units.

Surface water All naturally occurring water, other than sub-surface water, which results from rainfall on the site or water flowing onto the site, including that flowing from a drain, stream, river, lake or sea.

Vent pipe A pipe for the purpose of protecting water seals that at its upper end is either open to the atmosphere or fitted with an air admittance valve and that at its lower end is connected to a discharge pipe.

Waste pipe A discharge pipe that conveys the discharge from waste water fixtures to a gully trap.

Waste water fixture A sanitary fixture or sanitary appliance used to receive wastes, and which is not a soil fixture.

Water seal The depth of water that can be retained in a water trap.

Water trap A fitting designed to retain a depth of water that prevents foul air and gases escaping from the plumbing system or foul water drainage system and entering a building.
Verification Method G13/VM1
Sanitary Plumbing

1.0 Sanitary Plumbing

1.0.1 A design method for conveying *foul* water from *buildings*, and for avoiding the likelihood of foul air entering *buildings*, may be verified as satisfying the relevant Performances of NZBC G13 if the method complies with BS EN 12056.2.
Acceptable Solution G13/AS1
Sanitary Plumbing

1.0 Scope

1.0.1 This Acceptable Solution applies to above-ground non-pressure (gravity flow) sanitary plumbing for buildings having 3 levels or less and includes all pipework for foul water within, or on the building, including any basements.

1.0.2 The solution does not include:
   a) Specialised types of sanitary fixtures or sanitary appliances used within buildings such as hospitals, laboratories and factories, or
   b) The conveyance of industrial liquid wastes, chemical or toxic wastes and other wastes which cannot be discharged to a sewer without pretreatment.

1.0.3 Protection of water seals

Water seals shall be protected from pressure fluctuations within the sanitary pipework so as to prevent foul air and gases from entering the building. The method described in this Acceptable Solution for protecting water seals is based on a fully vented plumbing system and generally requires each fixture discharge pipe to be vented.

2.0 Materials

2.1 Pipes, traps and fittings

2.1.1 Materials for sanitary plumbing systems using gravity flow shall comply with Table 1.

3.0 Water Traps

3.1 Water trap requirements

3.1.1 Discharge points from sanitary fixtures and sanitary appliances shall have a water trap to prevent foul air from the plumbing system entering the building.

3.1.2 Water traps shall be:
   a) Removable,
   b) Able to be dismantled, or
   c) Fitted with a cleaning eye.

Table 1: Pipes, traps and fittings

<table>
<thead>
<tr>
<th>Material</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipes and fittings</td>
<td>ASSE 1050 or ASSE 1051, EN 12380, AS/NZS 4936</td>
</tr>
<tr>
<td>Copper pipe</td>
<td>NSZ 3501</td>
</tr>
<tr>
<td>Copper fittings</td>
<td>AS 1589</td>
</tr>
<tr>
<td>PVC pipe and fittings</td>
<td>AS/NZS 1260</td>
</tr>
<tr>
<td>Plastic fittings</td>
<td>AS 2887</td>
</tr>
<tr>
<td>PE pipe and fittings</td>
<td>AS/NZS 4401</td>
</tr>
<tr>
<td>Elastomeric rings</td>
<td>AS/NZS 4130 or AS 1646</td>
</tr>
</tbody>
</table>

Traps

| Plastic | AS 2887 |
| Copper | AS 1589 |

COMMENT:
Individually venting each fixture discharge pipe provides the greatest flexibility in the arrangement and lengths of discharge pipes.

COMMENT:
Removable panels are not required for access to bath traps.
3.2 Water trap dimensions

3.2.1 Under normal operating conditions, fixture traps shall retain a water seal depth of not less than 25 mm (see Figure 1).

COMMENT:
1. The nominal depth of water seal is 75 ± 10 mm for waste water fixture traps.
2. The nominal depth of water seal is 50 ± 5 mm for soil fixture traps.
3. The system should be tested under load conditions to ensure that a 25 mm minimum water seal depth is not compromised.

3.2.2 The diameter of the water trap shall be not less than that given in Table 2.

3.3 Water trap location

3.3.1 A water trap shall:

a) Be located as close as possible to the sanitary fixture or sanitary appliance it serves,

b) Have a discharge pipe with a developed length not exceeding 1.2 m measured between the water seal and either the sanitary fixture outlet or the sanitary appliance discharge point, and

c) Not be located in a different room to the sanitary fixture or sanitary appliance it serves.

COMMENT:
1. Waste material may build up on the walls of discharge pipes and may cause offensive odours to enter the building through the fixture outlet. A short discharge pipe reduces the likelihood of this happening.
2. Traps may be located under the floor or in ceiling spaces of the floor below.

3.3.2 Multiple outlets

A single water trap may serve any one of the following outlet combinations located within the same space (see Figure 2):

a) One or two adjacent domestic kitchen sinks together with a dishwashing machine.

b) One or two adjacent domestic kitchen sinks together with a waste disposal unit.

c) One or two adjacent laundry tubs together with a clothes washing machine.

d) Two adjacent basins, domestic kitchen sinks or laundry tubs.

e) One or two adjacent domestic kitchen sinks, together with a waste disposal unit and a dishwashing machine when fitted with a 50 mm trap and discharge pipe.

COMMENT:
Commercial sinks – one water trap is not permitted to serve two adjacent commercial sinks, as a sink containing foul water may contaminate an adjacent sink being used for food preparation.
### 3.4 Floor outlets

#### 3.4.1 Floor waste outlets shall have a removable grating that is flush with the floor.

**COMMENT:**
1. The grating is to permit safe and easy movement of people using the space containing the floor outlet.
2. *Floor wastes* in this section are not intended to receive liquid or excreted human wastes.

#### 3.4.2 The *floor waste*, and the *water trap* if used, shall have a minimum *diameter* of 40 mm.

#### 3.4.3 A *floor waste* shall:

a) Be trapped, discharge 50 mm above the grating of a *gully trap* and be vented as shown in Figure 3,

b) Be trapped, charged to maintain the *water seal* and discharge to the *foul water plumbing system* in accordance with Paragraphs 4.5 and 5.0, or

c) If its only purpose is to discharge accidental overflows:
   i) have no *water trap*,
   ii) discharge to the open air within the property boundary,
   iii) discharge to a safe location, and
   iv) be fitted with a means to prevent the entry of birds and vermin.

---

### Table 2: Fixture discharge pipe sizes and discharge units

<table>
<thead>
<tr>
<th>Sanitary fixture or appliance</th>
<th>Discharge units</th>
<th>Minimum trap and discharge pipe diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basin</td>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>Bath (with or without overhead shower)</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>Bathroom group (water closet pan, bath and shower, basin, and bidet in one compartment)</td>
<td>6</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>Bidet</td>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>Cleaner’s sink</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>Clothes washing machine (domestic)</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Dishwashing machine (domestic)</td>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td>Drinking fountain</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>Kitchen sink (commercial)</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>Kitchen sink (domestic, single or double, with or without waste disposal unit)</td>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td>Laundry (single or double tub, with or without a clothes washing machine)</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Shower</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>Urinal (1 or 2 stall)</td>
<td>1 per 600 mm length</td>
<td>50</td>
</tr>
<tr>
<td>Urinal (bowl type)</td>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>Urinal (3 or more stalls)</td>
<td>1 per 600 mm length</td>
<td>80</td>
</tr>
<tr>
<td>Water closet pan</td>
<td>4</td>
<td>80</td>
</tr>
</tbody>
</table>

*Note:*
1. For groups of fixtures, traps are sized for the individual fixtures. *Discharge pipes* for groups are sized in accordance with Paragraph 4.3.2.

---

**Table 2:**

*Sanitary fixture or appliance Discharge units Minimum trap and discharge pipe diameter (mm)*

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</tr>
<tr>
<td>Bath (with or without overhead shower)</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>Bathroom group (water closet pan, bath and shower, basin, and bidet in one compartment)</td>
<td>6</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>Bidet</td>
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<td>40</td>
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<tr>
<td>Clothes washing machine (domestic)</td>
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<td>40</td>
</tr>
<tr>
<td>Dishwashing machine (domestic)</td>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td>Drinking fountain</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>Kitchen sink (commercial)</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>Kitchen sink (domestic, single or double, with or without waste disposal unit)</td>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td>Laundry (single or double tub, with or without a clothes washing machine)</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Shower</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>Urinal (1 or 2 stall)</td>
<td>1 per 600 mm length</td>
<td>50</td>
</tr>
<tr>
<td>Urinal (bowl type)</td>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>Urinal (3 or more stalls)</td>
<td>1 per 600 mm length</td>
<td>80</td>
</tr>
<tr>
<td>Water closet pan</td>
<td>4</td>
<td>80</td>
</tr>
</tbody>
</table>

*Note:*
1. For groups of fixtures, traps are sized for the individual fixtures. *Discharge pipes* for groups are sized in accordance with Paragraph 4.3.2.
Figure 2: Multiple outlets
Paragraph 3.3.2

(a) Two adjacent domestic kitchen sinks and one dishwasher inlet

(b) Two adjacent domestic kitchen sinks and one disposal unit

(c) Laundry tub and discharge pipe for a clothes washing machine
Figure 3: Floor waste stacks and pipes
Paragraphs 3.4.3 and 3.4.4

Vent riser from stack shall terminate in accordance with Paragraph 5.7.4

Floor waste stack

Individual floor waste pipes connecting to a floor waste stack must discharge 50mm above a gully dish

Gully dish

(a) Multiple floor waste pipes connecting to floor waste stack

(b) Single floor waste pipes connecting to floor waste stack
3.4.4 Floor waste pipes may be combined to form a floor waste stack and shall have a diameter not less than that given in Table 3 (see Figure 3).

Individual floor waste pipes connected to a floor waste stack need not be vented (see Figure 3).

3.4.5 Floor waste discharge stacks shall:

a) Be open vented,
b) Be vented independently from any other sanitary plumbing system, and
c) Comply with the termination requirements of Paragraph 5.7.4.

COMMENT:
Independent venting reduces the risk of foul air and gases entering the floor waste system.

3.4.6 Charging floor wastes

The water seal of a trapped floor waste discharging directly to the foul water plumbing system shall be maintained by (see Figure 4):

a) A charge pipe of not less than 32 mm diameter from a tap or a drain from a hot or cold water relief valve, which shall drain over a tundish so that the air gap is maintained,
b) A mechanical trap priming device and discharge pipe,
c) A tap for floor washing, located in the same room and in close proximity to the floor waste.

In all cases the charge pipe shall have a maximum length of 10 m.

All trap charging systems shall incorporate backflow prevention in accordance with G12/AS1.

COMMENT:
Backflow protection can be achieved by an appropriate air gap or backflow prevention device.

4.0 Discharge Pipes

4.1 Layout

4.1.1 Discharge pipes shall follow the most practicable route with the least number of bends.

4.2 Access for cleaning

4.2.1 Access points shall be provided in discharge pipes to allow the easy clearance of blockages.

4.2.2 Access points shall be provided at the following points:

a) At the junction of a soil discharge pipe with a discharge stack,
b) Where a number of changes of direction occur,
c) In a discharge pipe where access to junctions or changes of direction are restricted, and
d) At the base of any soil stack at the point of connection to the drain.

COMMENT:
Proprietary fittings that provide access into the pipe should be used at these points.
Figure 4: Methods of charging floor waste traps
Paragraph 3.4.6

(a) Connection of tundish

(b) Trap primer arrangement

- Tap located in close proximity of floor waste
- Removable grate
- Air gap 25mm min.
- Tundish
- Drain from hot or cold water relief valve
- Untapped charge pipe, minimum 32mm diameter, maximum length 10.0m

- Filter
- Mechanical trap priming device incorporating an air gap or backflow prevention system
- Charge pipe
- Removable grate
- Floor level
- Floor waste riser
4.3 Diameter

4.3.1 Fixture discharge pipes shall have diameters of not less than those given in Table 2 and shall not decrease in size in the direction of flow.

4.3.2 Where a discharge pipe receives the discharge from more than one fixture, the diameter of the discharge pipe shall be not less than that required in Table 4 using:

a) The discharge unit loading to be conveyed, calculated as the sum of the discharge unit loading given in Table 2, for all fixtures served, and

b) The gradient of the discharge pipe.

4.4 Gradient

4.4.1 The gradient of discharge pipes shall be not less than that required in Table 4 for the relevant discharge unit loading.

COMMENT:
The minimum gradients specified are necessary to avoid the risk of blockage.

4.5 Fixture discharge pipes serving waste water fixtures

4.5.1 Waste water fixture discharge pipes shall discharge either to:

a) A gully trap, in accordance with Figure 5 of G13/AS1 and Figure 3 of G13/AS2, or

b) A discharge stack as in Paragraph 4.7 and Figures 7 and 8.

4.5.2 Water seal protection: Waste water fixture discharge pipes shall be vented to comply with Paragraph 5.0 and as required in Table 5.

4.6 Fixture discharge pipes serving soil fixtures

4.6.1 Fixture discharge pipes serving soil fixtures shall discharge either:

a) Directly to the drain, as shown in Figure 6(1), or

b) To a stack, as in Paragraph 4.7 and as shown in Figures 7 and 8.

4.6.2 Water seal protection: Soil fixture discharge pipes shall be vented to comply with Paragraph 5.0 and as required in Table 5 (see Figure 6(2)).

Table 4: Discharge unit loading for stacks and graded discharge pipes

<table>
<thead>
<tr>
<th>Diameter (mm)</th>
<th>Maximum discharge from any one floor</th>
<th>Vertical stack (Note 1) 1:20</th>
<th>Graded discharge pipes</th>
<th>Minimum gradient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1:30 1:40 1:50 1:60</td>
</tr>
<tr>
<td>32</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>50</td>
<td>5</td>
<td>15</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>65</td>
<td>6</td>
<td>18</td>
<td>29</td>
<td>21</td>
</tr>
<tr>
<td>80</td>
<td>13</td>
<td>40</td>
<td>39</td>
<td>27</td>
</tr>
<tr>
<td>100</td>
<td>65</td>
<td>195</td>
<td>248</td>
<td>182</td>
</tr>
</tbody>
</table>

Note:
Shaded area = not permitted

1. Total loading at the base of the discharge stack.
Figure 5: Waste pipes discharging to a gully trap
Paragraph 4.5.1 a)

(a) Individual waste pipes

Each waste pipe must be vented in accordance with Paragraph 8.0

(b) Combined waste pipes

See Figure 3 of G13/AS2 for alternative methods of connecting waste pipes to the gully trap.

Note:
Upper floor waste pipes may discharge to a gully trap however venting will be required where wastes are combined or where specified lengths are exceeded. See Table 5.
Waste pipes may also discharge to a stack. See Figures 7 and 8.
Figure 6: Soil fixture discharge pipes
Paragraphs 4.6.1 a), 4.6.2, 5.5.2 a)

1) Discharge pipes serving soil fixtures connected individually to the drain and utilizing a drain vent as fixture vent

- a) S or P trap vented pan, fixture vent pipe connected to pan horn installed and terminated in accordance with Paragraph 5.0
- b) S or P trap pan, air admittance valve fitted to pan horn, valve to be installed in accordance with Paragraph 5.8 (valve must be vertical and secured in place)
- c) S or P trap non-vented pan, fixture vent pipe connected to the graded discharge pipe within 1.5m from the crown of the water trap and 300mm above any bend at the base of vertical drop
- d) S or P trap non-vented pan, fixture vent connected to the vertical discharge pipe as for c)

2) Discharge pipes serving soil fixtures connected individually to the drain or to a stack and utilizing a fixture vent
Figure 7: Vertical discharge stack
Paragraphs 4.5.1 b), 4.6.1 b), 4.7.1 b), 4.7.2 a), 5.2.1 b), 5.6.2, 5.6.3 a) b)
4.7 Discharge stacks

4.7.1 Discharge stacks shall:

a) Have a diameter of not less than that given in Table 4 using:
   i) the discharge unit loading to be conveyed, calculated as the sum of the discharge unit loadings required in Table 2 for all fixtures served, and
   ii) the gradient of the discharge stack.

b) For vertical stacks, be extended up past the top-most branch connection to form a discharge stack vent (see Paragraph 5.0 and Figure 7).

c) For graded discharge stacks, have a discharge stack vent connected to the graded section of the stack downstream of the highest fixture, in accordance with Paragraph 5.0 and Figure 8.
4.7.2 Where discharge pipe connections to vertical discharge stacks:
a) Are near the base of a discharge stack, they shall not be connected to the discharge stack or drain within the positive pressure zone as shown in Figure 7.

COMMENT:
Whenever a discharge stack incorporates a bend greater than 45°, a hydraulic jump may occur in the horizontal pipe downstream of the bend. The hydraulic jump can cause very high positive pressures in the pipe near the bend. If a branch pipe is connected to the discharge stack in this zone, these high pressures may blow out water seals connected to that branch pipe.

b) Consist of two branches entering the discharge stack at the same level, they shall have a double Y-junction with either:
   i) sweep entries, or
   ii) entries with an included angle of 90° (see Figure 9 (b)).
c) Are at different levels, they shall not be connected to the discharge stack within the restricted entry zones shown in Figure 9 (a), unless the connection method is in accordance with Figures 9 (b) and (c).

4.7.3 Where discharge pipe connections are to graded discharge stacks they shall not enter at opposite positions and if they are near bends they shall not be made within 450 mm of any bend (see Figure 8).

4.7.4 The change of direction at the base of any vertical section in a discharge stack shall incorporate:
a) Two nominal 45° bends, or
b) One nominal 45° bend and a Y-junction.

5.0 Venting

5.1 Venting required

5.1.1 Discharge pipes shall be vented where required by Table 5.

5.1.2 Vent pipes that serve fixtures that discharge to a gully trap or grease trap shall be vented independently of any vent pipe system connected directly to the foul water drainage system.

COMMENT:
An independent vent pipe system for fixtures discharging to a gully trap is necessary to avoid the risk of sewer gases escaping through any waste pipes discharging to a gully trap.

5.2 Vent pipes

5.2.1 Vent pipes shall be one of the following types:
a) A vertical or graded fixture vent pipe terminating in accordance with Paragraph 5.7.1 or 5.8.1 (see Figure 10 (a)), or
b) An ascending graded or vertical fixture vent pipe to connect to:
   i) a branch vent pipe, as shown in Figure 10 (b),
   ii) a discharge stack vent as shown in Figures 7, 8 and 10 (b), or
   iii) a relief vent, as shown in Figure 7.
The connection shall be made at a height of not less than 50 mm above the overflow level of the sanitary fixture it serves.

5.3 Diameter of vent pipes

5.3.1 Fixture vent pipes, branch vent pipes, discharge stack vents and relief vents shall have a diameter of no less than that given in Table 6.
## Venting requirements

### Paragraphs 4.5.2, 4.6.2, 5.1.1, 5.5.1, 5.5.2 and 5.8.1

### Stacks

**Stack vent:** All stacks discharging to another stack or to a drain require an open vent, sized in accordance with Table 6. Venting with an air admittance valve is permitted only on second and subsequent stacks as at least one open vent (the stack vent, if acting as main drain vent) is required to ventilate the drain.

**Relief vent:** All stacks that receive discharges from 3 floor levels shall be vented with a relief vent sized in accordance with Table 6. Relief vents shall be open vented.

### Fixtures connected to a stack

All connections to a stack, except the highest connection, require venting by either an open vent, or an air admittance valve, sized in accordance with Table 6.

### Highest fixture connected to a stack

The individual highest connection to a stack requires venting by either an open vent, or an air admittance valve, sized in accordance with Table 6, if the discharge pipe is longer than:

- 6 m for 100 mm pipe,
- 1.5 m for 80 mm pipe, and
- 3.5 m for 65 to 32 mm pipes.

### Soil fixtures connected to an unvented branch drain

All soil fixtures connected to an unvented branch drain require venting by either an open vent, or an air admittance valve, sized in accordance with Table 6.

### Soil fixtures connected to a vented drain with a gradient of less than 1:60

All soil fixtures connected to a vented drain, where the branch and the vented drain are at a gradient of less than 1:60, require venting by either an open vent, or an air admittance valve sized in accordance with Table 6.

### Individual soil fixtures connected to a vented drain with a gradient of 1:60 or steeper

Individual soil fixtures connected to a vented drain, where the branch and the vented drain are at a gradient of 1:60 or steeper, require venting by either an open vent, or an air admittance valve, sized in accordance with Table 6, if the discharge pipe is longer than:

- 6 m for 100 mm pipe, or includes a vertical drop greater than 2 m, and
- 1.5 m for 80 mm pipe diameters.

### Fixtures discharging to a gully trap

1. Fixtures connected to a combined waste pipe require venting by either an open vent, or an air admittance valve, sized in accordance with Table 6.
2. Individual fixture discharge pipes over 3.5 m in length require venting by either an open vent, or an air admittance valve, sized in accordance with Table 6.
3. Where any 32 mm discharge pipe has a vertical drop of greater than 1.5 m it shall be vented with a 32 mm vent pipe or an air admittance valve.

### Venting of main drains

Main drains discharging to the sewer or to an on-site disposal system are required to be vented with a minimum 80 mm open vent.

### Venting of branch drains

Branch drains connected to a vented drain that exceed 10 m in length require venting with an open vent, sized in accordance with Table 6.
Figure 9: Restricted zone connections to stacks
Paragraph 4.7.2 b) c)

(a) Restricted zones

(i) Y Junction entry
(ii) Sweep Junction entry

(b) Permitted connections within restricted zones

(i) opposite 45° connection
(ii) double Y Junction
(iii) saddle entry to zone

(c) Connection near restricted zone

(i) drop connection plan
(ii) drop connection elevation
Figure 10: Acceptable methods of vent pipe installation
Paragraphs 5.2.1 and 5.8.4

(a) Vertical and/or graded fixture vent pipe open at its upper end

(b) Vertical and/or graded fixture vent pipe connection to discharge stack or branch vent pipe

(c) Air admittance valve
5.4 Gradient of vent pipes

5.4.1 Fixture vent pipes and branch vent pipes shall extend upwards from the point of connection to the fixture discharge pipe to the open atmosphere, or to an air admittance valve, with a gradient of not less than 1:80.

5.5 Connection of vents to fixture discharge pipes

5.5.1 The fixture vent pipe, when required by Table 5 for fixtures discharging to a gully trap, shall connect to the waste pipe at a point between 75 mm and 3.5 m from the crown of the water trap, as shown in Figure 11 (a).

5.5.2 The fixture vent pipe, when required by Table 5 for fixtures discharging to a stack or directly to the drainage system, shall connect:

a) If serving a WC pan:

i) to the vent horn of the pan, or

ii) to the discharge pipe within 1.5 m of the crown of the trap, and not less than 300 mm above any bend at the base of a vertical drop (see Figure 6(2)).

b) If serving a basin or bidet: at a point between 75 mm and either (see Figure 11 (b)):

i) 600 mm from the crown of the water trap, or

ii) before the first bend in the fixture discharge pipe.

c) If serving other fixture discharge pipes: at a point between 75 mm and 1.5 m from the crown of the water trap, provided that the connection is not less than 300 mm above any bend at the base of a vertical drop within the fixture discharge pipe (see Figure 11 (b)).
Figure 11: Acceptable location for connection of fixture vent pipes to fixture discharge pipes
Paragraphs 5.5.1, 5.5.2 b) c)

(a) Waste pipes discharging to a gully dish

(b) Fixture discharge pipes discharging to a discharge stack

Sanitary fixtures other than basins and bidets

See figure 6 for vent connections to soil fixture discharge pipes.
5.6 Discharge stack and relief vents

5.6.1 The discharge stack vent, if also acting as a drain vent pipe shall have a diameter of not less than 80 mm. Where not acting as a drain vent the discharge stack vent pipe shall have a diameter of not less than that required in Table 6.

5.6.2 Every discharge stack serving sanitary fixtures or sanitary appliances from 3 floors within a building shall include a relief vent pipe as shown in Figure 7.

5.6.3 Relief vent pipes shall:

a) Connect to the bottom of the discharge stack at no less than 300 mm below the lowest discharge pipe served, and at an angle of 45°, as shown in Figure 7,

b) Be extended upwards at a gradient of no less than 1:80 to connect to the discharge stack vent, as shown in Figure 7, or extend separately to the atmosphere as an open vent,

c) Have a diameter of no less than that given in Table 6.

5.7 Termination of open vent pipes

5.7.1 Open vent pipes shall terminate outside the building in accordance with Paragraphs 5.7.2 and 5.7.3 or 5.7.4.

5.7.2 Vent pipes shall terminate outside the building and:

a) Be at a height of not less than 50 mm above the overflow level of the highest sanitary fixture they serve, and

b) Incorporate a means to prevent the entry of birds and vermin and shall have an open area not less than 80% of the cross-sectional area of the vent pipe they serve.

5.7.3 Open vent pipes serving discharge pipes directly connected to the foul water drainage system shall terminate no closer to building elements than (see Figure 12):

a) Ground level – 3.0 m above,

b) Windows and other openings – 600 mm above, and 3.0 m below and horizontally,

c) Roofs – 150 mm above,

d) Decking having pedestrian access – 3.0 m above, below and horizontally,

e) Eaves or parapets – 600 mm above, below and horizontally, and

f) Air intakes – 5.0 m in any direction.

 COMMENT: These requirements reduce the likelihood of foul air from the foul water drainage system entering the building.

5.7.4 Fixture vent pipes serving waste pipes discharging to a gully trap shall:

a) Terminate outside the building and be not less than 900 mm from any opening to the building, and

b) Be vented to the atmosphere independently of any vent pipe system connected directly to the foul water drainage system.

 COMMENT: 1. The location of the outlet of the vent pipe serving a waste pipe is less restrictive than the requirements for vent pipes serving discharge pipes connected directly to the drain. This is permitted because a waste pipe is not connected directly to the foul water drainage system, and hence a source of foul air.

2. An independent vent pipe system for waste pipes is needed to avoid the risk of sewer gases escaping through a waste pipe to a gully trap.

5.8 Air admittance valves

5.8.1 General

Air admittance valves may be used as venting where specified in accordance with Table 5.

5.8.2 Air admittance valves shall be manufactured to ASSE 1050, ASSE 1051, EN 12380 or AS/NZS 4936.

5.8.3 Size of air admittance valves

The air admittance valve shall have a diameter no less than that given in Table 6, and be no smaller in diameter than the vent pipe that it serves.

Air admittance valves that form an integral part of a fixture trap shall only be used as a trap vent.
5.8.4 Location

*Air admittance valves* shall be installed in an upright (vertical) position at least 100 mm above the weir of the fixture trap and in a location (see Figure 10 (c)):

a) Accessible for maintenance and inspection,

b) Where the valve is unlikely to become frozen,

c) Protected from likely damage, and

d) Where *adequate* air can enter the valve.

Ventilated openings shall be provided for *air admittance valves* installed within a wall space. The free area of the openings shall be not less than 1.5 times that of the *vent pipe*.

**COMMENT:**
A significant amount of ventilating pipework and roof penetrations may be avoided with the use of *air admittance valves*. However, the pipework sizing, whether for individual fixture vents or branch vents, should follow the requirements of this Acceptable Solution. *Air admittance valves* are intended for anti-siphon situations and may not protect the *water seals* of traps in positive pressure situations.

6.0 Installation

6.1 Jointing methods

6.1.1 Jointing methods for PVC-U pipe shall comply with AS/NZS 2032.
6.2 Pipe supports

6.2.1 Pipes shall be supported at centres not exceeding those in Table 7.

6.2.2 For PVC-U pipes carrying discharges of greater than 60°C, support for the pipe shall be in accordance with Paragraph 6.3.2 of AS/NZS 2032.

**COMMENT:** Supports are required to ensure that the pipe gradient does not fall below minimum values given in Paragraph 4.2.1.

6.3 Thermal movement

6.3.1 The plumbing system shall accommodate without failure the expected longitudinal movement in pipes resulting from temperature changes. All copper and PVC-U pipes shall incorporate expansion joints. The provisions described in Section 6.4 of AS/NZS 2032 shall be used for PVC-U pipes.

6.3.2 At supports, and at wall and floor penetrations not incorporating expansion joints, movement shall be accommodated using pipe sleeves or a durable and flexible lagging material.

**COMMENT:**
1. Thermal expansion will cause a 10 m length of PVC-U to extend 0.8 mm for each 1°C rise of pipe temperature.
2. Provision for thermal movement by correctly locating expansion joints, with fixed and sliding supports, prevents damage to pipes and fixtures.

### Table 7: Distances Between Supports

<table>
<thead>
<tr>
<th>Material</th>
<th>Pipe diameter (mm)</th>
<th>Maximum distance between supports (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Vertical pipe</td>
</tr>
<tr>
<td>Copper pipes</td>
<td>32 to 50</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>greater than 50</td>
<td>3.5</td>
</tr>
<tr>
<td>PVC-U pipes</td>
<td>32 to 50</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>65 to 100</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>greater than 100</td>
<td>1.8</td>
</tr>
</tbody>
</table>

6.4 Fire separation

6.4.1 Fire stopping shall be fitted to pipes passing through fire separations in accordance with C/AS2–6 Paragraph 4.4.

7.0 Watertightness

7.1 Test methods

7.1.1 All above ground sanitary plumbing pipework shall be tested by water test or air test to verify that the system is watertight.

7.1.2 Water test: The method described in AS/NZS 2032 may be used for ensuring watertightness of above ground sanitary plumbing pipework.

7.1.3 Air tests may be carried out in accordance with either clause 15.3 of AS/NZS 3500.2 or paragraph 8.3 of E1/VM1.
Verification Method G13/VM2

Drainage

1.0 Drainage

1.0.1 No specific methods have been adopted for verifying compliance with the Performance of NZBC G13.

COMMENT:
AS/NZS 3500.2 is referenced in G13/AS3.
Acceptable Solution G13/AS2

Drainage

1.0 Scope

1.0.1 This Acceptable Solution is for below ground non-pressure (gravity flow) foul water drains having a diameter of no greater than 150 mm.

1.0.2 It does not apply to foul water drainage systems where it is necessary to dispose of industrial liquid wastes, chemical or toxic wastes and other wastes which cannot be discharged to a sewer without pre-treatment. See G14/VM1.

2.0 Materials

2.0.1 Materials for drainage pipes and joints shall comply with the appropriate standards shown in Table 1.

2.1 Fill materials

2.1.1 Fill materials, as shown in Figure 7, shall be:

a) Bedding material of clean granular non-cohesive material with a maximum particle size of 20 mm,

b) Selected fill of fine-grained soil or granular material that is free from topsoil and rubbish and has a maximum particle size of 20 mm, or
c) Ordinary fill of excavated material.

3.0 Design

3.1 Bends

3.1.1 To reduce the risk of blockages, the foul water drainage system shall:

a) Have a simple layout that incorporates the least number of changes of direction,
b) Use bends having a radius of the practical maximum, and
c) Be laid only in straight lines between bends or junctions (both horizontally and vertically).

3.2 Junctions

3.2.1 Any connection to a drain, excluding vent pipe connections, shall be made by means of sweep or oblique junctions. The angle that the branch makes at the point of entry with the main drain, shall be no greater than 60° (see Figure 1).

---

Table 1: Materials for drainage pipes

<table>
<thead>
<tr>
<th>Material</th>
<th>Manufacturing Standard</th>
<th>Installation Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast iron</td>
<td>BS 437</td>
<td></td>
</tr>
<tr>
<td>Concrete</td>
<td>AS/NZS 4058</td>
<td></td>
</tr>
<tr>
<td>Steel</td>
<td>NZS 4442 or AS 1579</td>
<td></td>
</tr>
<tr>
<td>PVC-U</td>
<td>AS/NZS 1260</td>
<td>AS/NZS 2032</td>
</tr>
<tr>
<td>Polyethylene</td>
<td>AS/NZS 4130, AS/NZS 5065</td>
<td>AS/NZS 2033</td>
</tr>
<tr>
<td>Polypropylene</td>
<td>AS/NZS 5065</td>
<td>AS/NZS 2566</td>
</tr>
<tr>
<td>Ductile iron</td>
<td>AS/NZS 2280</td>
<td></td>
</tr>
<tr>
<td>ABS</td>
<td>AS/NZS 3518</td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>NZS 3501</td>
<td></td>
</tr>
<tr>
<td>GRP</td>
<td>AS 3571</td>
<td></td>
</tr>
<tr>
<td>FRC</td>
<td>AS 4139</td>
<td></td>
</tr>
<tr>
<td>Elastomeric rings</td>
<td>AS 1646</td>
<td></td>
</tr>
</tbody>
</table>
### 3.3 Gully traps

#### 3.3.1 All gully traps shall be constructed to prevent the ingress of surface water and foreign bodies likely to cause a blockage, shall be located within the legal boundary of the land on which the building is erected, and shall have (see Figures 2 and 3):

- **a)** The overflow level of the gully dish no less than:
  - i) 25 mm above paved surfaces, or
  - ii) 100 mm above unpaved surfaces,

**COMMENT:**
It is imperative that the waste pipe connections to the gully trap remain watertight to prevent the ingress of ground/surface water.

- **b)** A grating that will allow surcharge,
- **c)** A minimum outlet pipe diameter of 100 mm,
- **d)** A water seal depth of at least 65 mm,
- **e)** At least one discharge pipe discharging to the gully trap to avoid water seal evaporation,
- **f)** Waste pipes that discharge to the gully trap arranged to permit easy cleaning of the gully trap,
- **g)** Waste pipe outlets located at least 20 mm above water seal level, and at least 20 mm below the grating,
Figure 3: Methods of connecting to gully traps
Paragraph 3.3.1

- **Paragraph 3.3.1**

  a) Waste discharging to rear of gully dish
  - Grate to allow surcharge
  - Waste sleeved through concrete foundation

  b) Waste bend discharging over gully dish
  - Grate to allow surcharge
  - Waste sleeved through concrete foundation

  c) Strap boss to riser
  - Grate to allow surcharge
  - Waste sleeved through concrete foundation

  d) 4 way riser
  - Grate to allow surcharge
  - Waste sleeved through concrete foundation

  trap connector

  Backnut

  H: height above surrounding ground for all gully traps, dependent on surface finish. See Fig 2.
h) The top of the water seal no more than 600 mm below the top of the gully dish, and

**COMMENT:**

To permit the gully trap to be easily cleaned by hand.

i) Adequate support from bedding and backfilling with:
   
i) concrete no less than 75 mm thick surrounding the entire gully dish and which is separated from the building foundation, where the gully trap is likely to be damaged, or

ii) compacted bedding material complying with Paragraph 2.2.1, in other areas, and

j) A minimum of 600 mm clear access space above the gully dish.

### 3.3.2

In order to provide overflow relief for the drainage system, every building used for Housing shall be provided with at least one gully trap which shall:

a) Be positioned so that the top of the gully dish is no less than 150 mm below the overflow level of the lowest sanitary fixture served by the drainage system,

b) Have a grating that will allow surcharge,

c) Be located in a visible position, and

d) Be installed so that surcharge cannot enter into or under buildings.

### 3.4 Grease traps

3.4.1 Grease traps shall be provided for any discharge pipe serving a sink(s) where the foul water discharges to a soak pit.

3.4.2 In buildings other than Housing, grease traps shall be provided where waste water is likely to convey grease.

3.4.3 The capacity of a grease trap shall be at least twice the capacity of all sanitary fixtures and sanitary appliances discharging to it, and in no case less than 100 litres as shown in Figure 4.

3.4.4 For restaurants and cafés, the capacity of the grease trap shall be at least 5 litres for each person for whom seating is provided, and in no case less than that required by Paragraph 3.4.3.

3.4.5 Grease traps located outside a building shall be configured as shown in Figure 4.

3.4.6 The top of the outlet junction shall be extended to finished ground level and fitted with a watertight rodding point access cover as shown in Figures 4 and 10.

3.4.7 Other types of grease trap such as those that separate or digest grease must be approved by the network utility operator as required by G14/VM1 1.2.

### 3.5 Gradient of drains

3.5.1 Drains shall:

a) Be laid at an even grade, and

b) Have no obstructions to flow.

3.5.2 Drains shall be installed at the maximum practicable gradient.

3.5.3 The gradient of drainage pipes shall be not less than that required in Table 2 for the relevant discharge unit loading.

### Table 2: Drain discharge unit loading and minimum gradients

<table>
<thead>
<tr>
<th>Diameter (mm)</th>
<th>1:20</th>
<th>1:40</th>
<th>1:60</th>
<th>1:80</th>
<th>1:100</th>
<th>1:120</th>
<th>1:140</th>
<th>1:160</th>
<th>1:180</th>
<th>1:200</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>215</td>
<td>100</td>
<td>61</td>
<td>44</td>
<td>34</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>100</td>
<td>515</td>
<td>255</td>
<td>205</td>
<td>149</td>
<td>122</td>
<td>104</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>150</td>
<td>2920</td>
<td>1790</td>
<td>1310</td>
<td>1040</td>
<td>855</td>
<td>760</td>
<td>677</td>
<td>611</td>
<td>558</td>
<td>515</td>
</tr>
</tbody>
</table>

See Paragraph 5.2.2 for drains laid at gradients within shaded area.
Stacks acting as drain vent

Stack vent: All stacks discharging to a drain require an open vent, sized in accordance with Table 6 in G13/AS1. Venting with an air admittance valve is permitted only on second and subsequent stacks as at least one open vent (the stack vent, if acting as main drain vent) is required to ventilate the drain.

Table 3: Venting Requirements for Drains

Paragraph 4.1.2

Venting of main drains

Main drains discharging to the sewer or to an on-site disposal system are required to be vented with a minimum 80 mm open vent.

Venting of branch drains

Branch drains connected to a vented drain that exceed 10 m in length require venting with an open vent, sized in accordance with Table 6 in G13/AS1.
3.6 Diameter of drains

3.6.1 The **diameter** of a drain shall not decrease in size in the direction of flow.

3.6.2 Drains shall have a **diameter** of not less than 100 mm, except that 80 mm is acceptable where the drain serves only waste water fixtures.

3.6.3 Diameters and gradients of drains shall be no less than those given in Table 2 for the calculated discharge unit loading determined from Table 2 of Acceptable Solution G13/AS1 “Sanitary Plumbing”.

4.0 Drain Ventilation

4.1 Ventilation requirements

4.1.1 The drainage system shall be ventilated to allow a flow of air and to minimise the build up of foul air.

4.1.2 Every main drain, and every branch drain longer than 10 m, shall be ventilated in accordance with Table 3.

4.1.3 Ventilation shall be provided by a drain vent pipe located so that the length of drain upstream of the drain vent connection is less than 10 m (see Figure 5).

4.1.4 To allow for regular flushing of the drain vent connection, it shall be located downstream of, but not more than 10 m, from the discharge connection closest to the head of the drain (see Figures 5 (a) and 6).

**COMMENT:**
The head of the drain is that point on the drainage system that is the furthermost from the outfall.

4.1.5 Any open discharge stack vent that is located within 10 m from the head of the drain may be used as a drain vent (see Figure 5 (b)).

4.2 Diameter of drain vent pipe

4.2.1 A main drain vent shall have a minimum **diameter** of 80 mm, and shall comply with termination requirements of Paragraph 5.7.3 of G13/AS1 “Sanitary Plumbing”.

4.2.2 Branch drain vents shall be sized in accordance with Table 6 in G13/AS1.

5.0 Installation

5.1 Jointing

5.1.1 Rigid pipes shall have flexible joints to resist damage from differential settlement.

5.1.2 Jointing for PVC-U pipes and fittings shall be in accordance with the methods described in AS/NZS 2032.

5.2 Construction

5.2.1 Drains shall be constructed to withstand the combination and frequency of loads likely to be placed upon them without collapse, undue damage or undue deflection (see Figure 7). In addition, *adequate* support needs to be provided to prevent gradients becoming less than those required by Table 2 as a result of:

a) Differential settlement, or

b) Deflection of an unsupported span.

5.2.2 Where drains are laid at gradients of 1:80 or less, verifiable levelling devices shall be used to ensure uniform and accurate gradients.

**COMMENT:**
Laser and dumpy levels are recommended devices.

5.3 Construction methods

5.3.1 Figure 7 gives acceptable methods for the bedding and backfilling of the drainage pipes listed in Table 1 except where:

a) The trench is located within or above peat,

b) Scouring of the trench is likely due to unstable soils,

c) The horizontal separation between any building foundation and the underside of the pipe trench is less than that required by Paragraph 5.7.1, or

d) The cover H to the pipe is more than 2.5 m.
Figure 5: Position of drain vent pipe

Paragraphs 4.1.3, 4.1.4 and 4.1.5
5.3.2 Drains laid in ground described in Paragraph 5.3.1 shall be subject to specific design.

5.4 Trench width
5.4.1 The width B of the trench shall be no less than the pipe diameter D plus 200 mm. The width of the trench at the top of the pipe shall be no more than 600 mm unless the pipes in the trench are covered with concrete, as shown in Figure 7 (c).

5.5 Placing and compacting
5.5.1 Base bedding (beneath the pipe) shall be placed and compacted before pipes are laid.
5.5.2 Side bedding (along both sides of the pipe) and cover bedding (where used) up to 300 mm above the pipe, shall be compacted.

5.6 Proximity of trench to building
5.6.1 For light timber framed and concrete masonry buildings constructed to NZS 3604 or NZS 4229 in accordance with B1/AS1 pipe trenches which are open for no longer than 48 hours shall be located no closer than V to the underside of any building foundation, as shown in Figure 8. Where the trench is to remain open for periods longer than 48 hours the minimum horizontal separation shall increase to 3V in all ground except rock.

5.7 Access points
5.7.1 Except in accordance with Paragraphs 5.8 and 5.9, all drains shall be laid to allow easy access for maintenance and the clearance of blockages.
5.7.2 Drains shall be provided with access points to facilitate cleaning and the clearance of blockages. Such access points shall be constructed to prevent the ingress of ground water and tree roots.
5.7.3 Access points may comprise access chambers, inspection chambers, rodding points or inspection points. Methods of access point construction are shown in Figures 9 to 12.

COMMENT:
Roddng points are preferred to inspection points in landscaped or sealed areas and within buildings.
Figure 7: Bedding and backfilling
Paragraphs 5.2.1, 5.3.1 and 5.4.1

(a) Bedding type 'B' of NZS 7643
Cover greater than 500mm

(b) Bedding type 'D' of NZS 7643
Cover greater than 375mm

(c) Cover between 125mm and 375mm

NOTE:
1. Fill shall be:
   - Ordinary fill where drains are located below gardens and open country.
   - Compacted selected fill where the drains are located below residential driveways and similar areas subject to light traffic.
5.7.4 Access points shall be provided at the following locations:

a) Immediately prior to drain outfalls,

b) Immediately inside the boundary of the property served,

c) At the junction of every drain with another drain except that no access point is required where the branch drain is less than 2.0 m long and only serves a gully trap,

d) Every change in horizontal direction of greater than 45°,

e) Every change in gradient greater than 45°,

f) At intervals (on straight lines) of no less than:

i) 50 m where rodding points are used, or

ii) 100 m where access chambers, inspection chambers or inspection points are used, and

g) Within 2.0 m outside the building where a drain enters or exits from under a building.
Figure 11: Inspection chambers
Figure 11: Inspection chambers
Paragraph 5.7.3

(a) Circular inspection chamber with inspection point

(b) Circular inspection chamber with open drain

450mm for drains 100mm dia or less, 600mm for drains greater than 100mm dia

Pipe must be completely bonded to concrete base. An acceptable method for uPVC pipes is either a manhole connector or a glued coating of dry sand to the outside of the pipe.

Flexible joint at corbel to be provided within 225mm of the inspection chamber.

Where this pipe stub has a downstream facing socket, it shall be encased as shown opposite.
Figure 12: Access chambers
Paragraph 5.7.3

(a) Circular access chamber with inspection point

- 500mm diameter opening with removable cover
- Mortar banding
- Pipe must be completely bonded to concrete base. An acceptable method for uPVC pipes is either a manhole connector or a glued coating of dry sand to the outside of the pipe
- Corbel to extend 150mm each side of pipe
- Flexible joint at corbel to be provided within 225mm of the inspection chamber
- Where this pipe stub has a downstream facing socket, it shall be encased as shown opposite

(b) Circular access chamber with open drain

- 500mm diameter opening with removable cover
- Mortar banding
- Pipe must be completely bonded to concrete base. An acceptable method for uPVC pipes is either a manhole connector or a glued coating of dry sand to the outside of the pipe
- Corbel to extend 150mm each side of pipe
- Flexible joint at corbel to be provided within 225mm of the inspection chamber
- Where this pipe stub has a downstream facing socket, it shall be encased as shown opposite
5.8 Additional requirements for drains installed under buildings

5.8.1 Drains installed under buildings shall be:
   a) Straight and of even gradient,
   b) Separated from the building foundation by at least 25 mm, and
   c) When passing through concrete, sleeved or wrapped in a durable and flexible material to allow for expansion and contraction.

5.8.2 Drains passing beneath buildings with a concrete slab on the ground floor shall have in addition to Paragraph 5.8.1:
   a) 50 mm clearance from the top of the pipe to the underside of the slab, and
   b) Junctions beneath the building joining at an angle of not more than 45° (see Figure 13).

5.9 Access to drains under buildings

5.9.1 Where two or more soil fixtures are connected to a branch drain beneath the building, access for cleaning shall be provided by a sealed floor level rodding point located downstream of the highest fixture connection to the branch drain (see Figures 10 and 13).

5.9.2 Access points located within a building shall be in an area that complies with the isolation and ventilation requirements for spaces in which soil fixtures are located.

COMMENT:
Refer to G1/AS1 “Personal Hygiene” and G4/AS1 “Ventilation”.

Figure 13: Drains under buildings
Paragraphs 5.8.2 and 5.9.1

[Diagram showing access points and drain layout under a building]
5.9.3 Access points may be located in a space containing a soil fixture.

5.10 Disused drains

5.10.1 Where a drain or part of a drain is no longer required, it shall be disconnected from the foul water drainage system at the junction with the live drain or at the property boundary.

5.10.2 The live drain shall be sealed by either of the following methods:

a) Purpose made junctions sealed with a tight-fitting plug that is fixed securely in place and does not protrude into the live drain, or

b) In in-situ formed junctions, where disused branch drains which have been inserted into an existing length of pipe, these shall be cut off as close as practicable to the junction and sealed with a purpose made cap, plug or stopper. Alternatively, the length of pipe into which the branch drain was inserted may be replaced.

COMMENT:
The unsatisfactory disconnection of old branch drains from live drains can lead to a source of major infiltration of ground water into the drainage system.

6.0 Watertightness

6.1 Testing

6.1.1 All sections of the drainage system shall be tested by water test or air test to ensure watertightness.

COMMENT:
Testing should be undertaken before backfilling for the easy identification of any leaks.

6.1.2 Water test

AS/NZS 2032 Section 11 gives an acceptable method for ensuring watertightness of below ground PVC-U drainage pipework.

6.1.3 Air tests may be carried out in accordance with either clause 15.3 of AS/NZS 3500.2 or paragraph 8.3 of E1/VM1.

6.1.4 Where a disused drain is being reinstated, the disused drain shall be tested to verify that the drain is sound.
Acceptable Solution G13/AS3

Plumbing and drainage

1.0 Installation of PVC-U pipe

1.0.1 AS/NZS 2032 is an Acceptable Solution for the installation of PVC-U pipe and fittings, but may exceed the performance criteria of NZBC G13.

2.0 AS/NZS 3500.2

2.0.1 AS/NZS 3500.2, Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, and 16, as modified by paragraph 2.0.2, is an Acceptable Solution for plumbing and drainage.

2.0.2 Modifications to AS/NZS 3500.2

Clause 2.2 Delete and replace with “Materials and products shall comply with NZBC B2 and G13/AS1 Paragraph 2.0 Materials”.

Section 3.19 Delete section.

Section 4.4 Replace “inspection shafts” with “access point” in this section.

Clause 4.6.6 This applies only to Housing.

Clause 5.6 Delete and replace with “Drains in other than stable ground shall be subject to specific design.”
Verification Method G13/VM4
Foul Water: On-Site Disposal

1.0 General

1.1 Scope

1.1.1 This document describes the design methods for systems used for the collection, storage, treatment and disposal of foul water.

1.1.2 A design method and construction details given in sections 5.1 to 5.5 and 6.1 to 6.2 of AS/NZS 1547 (and the appendices referred to in these sections), for the treatment of domestic foul water for flow rates up to a maximum 14,000 litres/week from a population equivalent of up to 10 persons, may be verified as satisfying the performance criteria of G13 Foul Water.
Index G13/VM1/VM2 & AS1/AS2

All references to Verification Methods and Acceptable Solutions are preceded by VM or AS respectively.

Access chambers......................... see Drains, maintenance access
Access points.............................. see Drains, maintenance access
Basins........................................ AS1 3.3.2, 5.5.2, Table 2
Baths............................................ AS1 Table 2
Bidets......................................... AS1 Table 2
Buildings
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Cleaners' sinks.............................. AS1 Table 2
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branch discharge pipes................... AS1 Figure 7
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gradient.................................... AS1 4.4, 5.4, AS2 3.5, Table 2
waste pipes
combined waste pipes...................... AS1 Figure 5
developed lengths........................ AS1 Figures 5, 6 and 8
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