NEW ZEALAND
EDICT OF GOVERNMENT

In order to promote public education and public safety, equal justice for all, a better informed citizenry, the rule of law, world trade and world peace, this legal document is hereby made available on a noncommercial basis, as it is the right of all humans to know and speak the laws that govern them.

[By Authority of New South Wales Code of Practice – Plumbing and Drainage]

We will sell to no man, we will not deny or defer to any man either justice or right.

Magna Carta—Tūtoringa Nui
Kore rawa e hoko ki te tangata, e kore e whakakāhoretia, e tautuku rānei te tangata ki te ture, tika ranei.
AS/NZS 3500.2:2003
(Incorporating Amendment Nos 1 and 2)
(A3 and A4 appended)
Australian/New Zealand Standard™

Plumbing and drainage

Part 2: Sanitary plumbing and drainage
AS/NZS 3500.2:2003

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee WS-014, National Plumbing and Drainage Code. It was approved on behalf of the Council of Standards Australia on 19 August 2003 and on behalf of the Council of Standards New Zealand on 22 August 2003. This Standard was published on 15 December 2003.

The following are represented on Committee WS-014:

- ACT Planning and Land Authority
- Association of Accredited Certification Bodies
- Association of Hydraulic Services Consultants Australia
- AUSTAP
- Australian Building Codes Board
- Australian Industry Group
- Australian Stainless Steel Development Association
- Copper Development Centre—Australia
- Department of Infrastructure, Energy and Resources (Tasmania)
- Department of Local Government, Planning, Sport and Recreation (Queensland)
- Gas Appliance Manufacturers Association of Australia
- Housing Industry Association
- Master Plumbers, Gasfitters and Drainlayers New Zealand
- New Zealand Water and Waste Association
- Plastics Industry Pipe Association of Australia
- Plastics New Zealand
- Plumbers Licensing Board of WA
- Plumbers, Gasfitters & Drainlayers Board
- Plumbing Industry Commission
- South Australian Water Corporation
- Sydney Water Corporation
- Water Services Association of Australia

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**Keeping Standards up-to-date**

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Web Shop at www.standards.com.au or Standards New Zealand web site at www.standards.co.nz and looking up the relevant Standard in the on-line catalogue.

Alternatively, both organizations publish an annual printed Catalogue with full details of all current Standards. For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia or Standards New Zealand at the address shown on the back cover.

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This Standard was issued in draft form for comment as DR 03203.
PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee WS-014, National Plumbing and Drainage Code to supersede AS/NZS 3500.2:1996 National Plumbing and Drainage, Part 2.2: Sanitary plumbing and drainage—Acceptable solutions.

This Standard incorporates Amendments No. 1 (November 2005), No. 2 (August 2006) and No. 3 (December 2010). The changes required by the Amendments are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The objective of this Standard is to provide installers with solutions to comply with—

(a) the Plumbing Code of Australia (PCA); and
(b) the New Zealand Building Code (Clause G13 Foul water).

The revision of this Standard has been developed to complement the Plumbing Code of Australia and incorporates amendments and additions arising from industry requirements.

This Standard is part of a series for plumbing and drainage, as follows:

AS/NZS
3500 Plumbing and drainage
3500.0 Part 0: Glossary of terms
3500.1 Part 1: Water services
3500.2 Part 2: Sanitary plumbing and drainage systems (this Standard)
3500.3 Part 3: Stormwater drainage systems
3500.4 Part 4: Heated water services
3500.5 Part 5: Domestic installations

This revision includes the following changes:

(i) Alignment with the Plumbing Code of Australia (PCA).
(ii) Revision of the materials used in plumbing and drainage.
(iii) New provisions covering multi-unit development.
(iv) Incorporation of Amendments 1 and 2.
(v) PL-001 rulings 2002, Numbers 1 to 35.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

Where alternative Australian or New Zealand standards are referenced (such as AS 1345 or NZS 5807 as appropriate) the Australian Standard shall be used for Australia and the New Zealand Standard shall be used for New Zealand.

Statements expressed in mandatory terms in notes to figures and tables are deemed to be requirements of this Standard.

PROVISION FOR REVISION

This Standard necessarily deals with existing conditions, but is not intended to discourage innovation or to exclude materials, equipment and methods, which may be developed in future. Revisions will be made from time to time in view of such developments and amendments to this edition will be made only when absolutely necessary.
This Standard incorporates commentary on some of the clauses. The commentary directly follows the relevant clause, is designated by 'C' preceding the clause number and is printed in italics in a panel. The commentary is for information only and does not need to be followed for compliance with the Standard.
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SECTION 1  SCOPE AND GENERAL

1.1 SCOPE AND APPLICATION

1.1.1 Scope

This Standard specifies the requirements for the design and installation of sanitary plumbing and drainage from the fixtures to a sewer, common effluent system or an on-site wastewater management system, as appropriate.

The Standard applies to new installations as well as alterations, additions or repairs to existing installations.

Illustrations used in this Standard are diagrammatic only and have been chosen without prejudice.

NOTE: The pre-treatment of trade wastes is not specified in this Standard.

1.1.2 Application

1.1.2.1 Plumbing Code of Australia reference

This Standard will be referenced in the Plumbing Code of Australia.

1.1.2.2 New Zealand Building Code reference

This Standard may be used for compliance with New Zealand Building Code, Clause G13 Foul water.

1.2 NORMATIVE REFERENCES

The normative documents referenced in this Standard are listed in Appendix A.

NOTE: Documents referenced for informative purposes are listed in the Bibliography.

1.3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 3500.0 and the one below apply:

1.3.1 Pressure attenuator

A device used as an alternative to relief venting to reduce positive air pressure pulses in discharge stacks.
1.4 PLASTICS ABBREVIATIONS

The following plastics abbreviations are used in this Standard.

ABS Acrylonitrile butadiene styrene
GRP Glass-filament-reinforced thermosetting plastic
PP Polypropylene
PP-R Polypropylene random copolymer
PB Polybutylene
PE-HD High density polyethylene
PE-X Cross-linked polyethylene
PVC-U Unplasticized polyvinyl chloride
PVC-M Modified polyvinyl chloride
PVC-O Oriented polyvinyl chloride

1.5 MEASUREMENT OF PIPE LENGTH

For the purposes of this Standard, the length of a branch drain or discharge pipe shall be measured along the centre-line from the weir of the trap to the point of connection to a stack, graded discharge pipe, drain or other drainage trap (see Figure 1.1)

1.6 PIPE GRADES

In this Standard, pipe grades are expressed as a percentage of vertical to horizontal distances.

1.7 EQUIVALENT PIPE SIZES

Nominal sizes of pipes and fittings quoted in this Standard are applicable to all materials listed in Appendix C, except for polyethylene (PE) and polypropylene (PP). Where the nominal size of a pipe or fitting is specified in this Standard, an equivalent pipe size, appropriate to polyethylene and polypropylene pipes and fittings, shall be selected from Table 1.1.
### TABLE 1.1
**EQUIVALENT SIZES FOR PE AND PP PIPES AND FITTINGS**

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SECTION 2 MATERIALS AND PRODUCTS

2.1 SCOPE OF SECTION
This Section specifies requirements for materials and products to be used in sanitary plumbing and drainage systems.

2.2 AUTHORIZATION
Materials and products used in Australia for plumbing and drainage installations shall have been authorized in accordance with the Plumbing Code of Australia (PCA). In New Zealand product authorization is not required.

The Plumbing Code of Australia (PCA) requires the materials and product types listed in Table A.2.1 be certified under the WaterMark Certification Scheme. A schedule of materials and product types requiring authorization and relevant specifications is included in AS 5200.000.

NOTE: A database of authorized products is available from www.watermark.standards.org.au

2.3 SELECTION AND USE OF MATERIALS AND PRODUCTS
Materials and products used in sanitary plumbing and drainage shall be selected to ensure they are fit for their intended purpose.

The pipes and fittings shall be selected from those listed in Appendix C, unless otherwise approved by the authority having jurisdiction.

Factors to be taken into account in the selection shall include, but are not to be limited to, the following:
(a) The type of usage likely to occur and the nature of the wastewater and the other matter to be conveyed.
(b) The nature of the environment.
(c) The physical and chemical characteristics of the materials and products.
(d) The possibility of abrasion by solids in the flow, or of chemical attack.
(e) The range of temperatures from the discharge that the sanitary plumbing and drainage system will be exposed to.
(f) Accessibility for inspection, service, repair and replacement.

NOTE: Information on some of the above items may be obtainable from the supplier or manufacturer of the material or product.

2.4 LIMITATIONS ON THE USE OF PIPES AND FITTINGS
2.4.1 General limitations
The following limitations shall apply to the use of pipes and fittings for plumbing and sanitary drainage installations.
(a) Bends in pipes shall be free from wrinkling and flattening.
(b) Pipes and fittings shall be protected from excessive ambient heat.

2.4.2 Metallic pipes and fittings
Metallic pipes and fittings shall comply with the following:
(a) Galvanized steel pipes and fittings shall—
(i) not be used for the conveyance of discharge from soil fixtures;
(ii) not be cement-lined;
(iii) not be bent; and
(iv) not be installed in inaccessible locations.

(b) Copper pipes and fittings shall not—

(i) be used to convey undiluted discharges from urinals, trade waste discharges that could have a deleterious effect upon the copper, e.g., wastes from photographic equipment or cooling towers; or

(ii) discharge from grease arrestors.

(c) Copper and copper alloy pipes shall not be bent in the field beyond an offset angle of 10°, except that Type D copper shall not be bent.

(d) Copper alloy bends and junctions used at the base of stacks greater than 9 m in height shall be cast or hot-pressed.

(e) Austenitic stainless steel pipes and fittings shall be Type 304, 304L, 316 or 316L or EN 10088, Grade EN 1.4301 or 1.4404.

(f) Stainless steel drains located below ground shall be Type 316 complying or EN 10088, Grade EN 1.4404.

2.4.3 Fabricated metallic pipes and fittings

Fabricated metallic pipes and fittings shall comply with the following:

(a) The fabrication of copper alloy fittings other than junctions shall not be permitted in the field.

(b) All fabricated copper bends and junctions at the base of stacks up to 9 m in height shall be formed of Type B or heavier gauge copper.

(c) The fabrication of stainless steel fittings and assemblies, including bending, shall not be permitted in the field.

2.4.4 Plastics pipes and fittings

Plastics pipes and fittings shall comply with the following:

(a) They shall be resistant to ultraviolet light when installed in direct sunlight.

(b) Glass-filament-reinforced thermosetting plastic (GRP) pipes shall have a minimum pipe stiffness of 5000 N/m deflection per metre length when installed below ground.

2.4.5 Other materials—Pipes and fittings

Pipes and fittings other than metallic or plastics shall comply with the following:

(a) Fibre-reinforced concrete (FRC) pipes shall not be used in waste lines receiving trade waste discharges that could have a deleterious effect upon the FRC, e.g., wastes from photographic equipment or cooling towers.

(b) Vitrified clay pipes and fittings shall comply with AS 1741 or BS EN 295-1.

Vitrified clay pipes and fittings shall not be used above ground except where installed as a riser connected to a fixture in accordance with Clause 3.8.3, or as a drain under buildings in accordance with Clause 4.3.2(b).

2.4.6 Pipes and fittings for pressure applications

Pipes and fittings for pressure applications shall comply with the relevant parts of Section 2 of AS/NZS 3500.1.
2.5 SHEET MATERIALS

2.5.1 Copper
Copper sheet shall be not inferior to alloy C12200 complying with AS 1566.

2.5.2 Stainless steel
Stainless steel sheet shall be not inferior to type 304 complying with ASTM A240/A240M, and shall be not less than 1.2 mm thick.

2.6 JOINTS

2.6.1 Flanged joints
Flanged joints shall comply with—

(a) AS/NZS 2280 and AS/NZS 2544 for ductile iron and grey cast iron; or
(b) AS 2129 or AS/NZS 4331 (all parts) or AS 4087 and be appropriate for the test pressure requirements described in Section 13.

2.6.2 Elastomeric seals
Elastomeric seal materials shall comply with the relevant part of AS 1646.
Where an elastomeric seal gasket is normally provided in the line or in a fitting, it shall not be replaced with mastic or sealant compounds.

2.6.3 Silver brazing alloy

2.6.3.1 Copper and copper alloys
Silver brazing alloys for capillary jointing of copper and copper alloy pipes and fittings shall comply with the requirements for silver brazing alloys or copper phosphorus alloys of AS/NZS 1167.1 and contain a minimum of 1.8% silver and a maximum of 0.05% cadmium.

2.6.3.2 Stainless steels
Silver brazing alloys for capillary jointing of stainless steel pipes and fittings shall comply with AS/NZS 1167.1 and contain a minimum of 38% silver and a maximum of 0.05% cadmium.

2.6.4 Filler rods for stainless steel joints
Joints in stainless steel pipework larger than DN 25 shall be made using filler rods of low carbon stainless steel not greater than 2 mm in diameter complying with AS/NZS 1167.2.

2.6.5 Plastics

2.6.5.1 Solvent cement and priming fluid
Solvent cement and priming fluid for jointing PVC-U and PVC-M pipes and fittings shall comply with AS/NZS 3879 and solvent cement shall be Type N—blue colour, and priming fluid shall be red colour.
Solvent cement shall not be used without priming fluid.

2.6.5.2 High density polyethylene(PE-HD)
Jointing of pipes and fittings shall be in accordance with AS/NZS 2033 and the manufacturer’s instructions.

2.7 CONCRETE AND MORTAR

2.7.1 Concrete mix
Pre-mixed concrete shall comply with AS 1379 and shall have a minimum characteristic compressive strength of 20 MPa, as specified in AS 3600 or NZS 3109, NZS 3124.
Site-mixed concrete shall consist of cement, fine aggregate and coarse aggregate, all measured by volume, and shall have sufficient water added to make the mix workable. It shall have a minimum characteristic compressive strength of 20 MPa.

2.7.2 Cement mortar

Cement mortar shall consist of one part cement and two parts of fine aggregate measured by volume, properly mixed with the minimum amount of water necessary to render the mix workable.

Cement mortar that has been mixed and left standing for more than 1 h shall not be used.

2.7.3 Chemical admixtures

Chemical admixtures used in concrete shall comply with AS 1478 or NZS 3113.

2.7.4 Water for concrete and mortar

Water used for mixing concrete and cement mortar shall be free from amounts of matter that are harmful to the mixture, the reinforcement or any other items embedded within the concrete or mortar.

2.7.5 Steel reinforcement

Steel reinforcing materials used in concrete structures shall comply with AS/NZS 4671.

2.8 MISCELLANEOUS

2.8.1 Timber

Timber exposed to the weather shall be of durability Class 2 complying with AS/NZS 2878 or shall be treated in accordance with AS 1604.1. In New Zealand, exposed timber shall be treated in accordance with MP 3640, H3 (CCA) to comply with NZS 3640.

Timber in contact with the ground shall be durability Class 1 for Australia and H4 (CCA) for New Zealand.

2.8.2 Epoxy resins

Epoxy resins shall be compatible with the materials being joined.

2.8.3 Pipe bedding

Pipe bedding materials shall comply with Clause 5.4.

2.8.4 Backfill

Backfill material shall comply with Clause 5.5.

2.8.5 External protective coatings

External coatings used for the protection of drains installed in corrosive areas shall—

(a) be impervious to the passage of moisture;

(b) be resistant to the external corrosive environment;

(c) be resistant to abrasion by the surrounding fill; and

(d) not contain any material that could cause corrosion to the underlying pipes or fittings.

NOTE: Polyethylene sleeving used to protect underground drains and may require additional protection if installed in rock or in stony ground.

2.8.6 Fibreglass reinforced plastics tanks

Fibreglass reinforced plastics tanks shall be manufactured in accordance with AS/NZS 1546.1.
2.8.7 Geotextiles

Geotextiles shall comply with the requirements of the regulatory authority.

NOTE: The methods of test for the determination of the properties of geotextiles are specified in AS 3706.0.
SECTION 3 DRAINAGE DESIGN

3.1 SCOPE OF SECTION
This Section specifies the requirements for the design of sanitary drainage systems.

3.2 LOCATION OF DRAINS
Any drain located under or inside a building shall only serve fixtures within that building.

NOTE: Drains should be located external to the building wherever practical.

3.3 SIZE AND LENGTH OF DRAINS

3.3.1 Fixture unit loading
The size of a drain shall be determined by the number of fixture units and type of fixtures discharging into it. The fixture unit loading for each pipe size and grade shall not exceed the maximum specified in Table 3.1. Fixture unit ratings are given in Tables 6.1 and 6.2.

3.3.2 Main drain
The minimum size of a main drain shall be DN 100.

3.3.3 Branch drains
The minimum size of a branch drain shall be DN 65.

3.3.4 Limitations on vented DN 80 branch drains
Not more than two water closet pans may be connected to a vented DN 80 branch drain. Any discharge pipe from a bath or laundry trough connected to a DN 80 vented branch drain shall be DN 40.

3.3.5 Use of eccentric taper fitting
Where any fixture with a P-trap of DN 40 or DN 50 is connected to a DN 65 branch drain, the eccentric taper fitting used to make the connection shall be fitted immediately downstream of the fixture trap (see Figure 3.1). The soffit of the fitting shall be in common alignment with the soffit of the pipe to which it is connected.

3.3.6 Size change
A drain shall not diminish in size in the direction of flow.

3.3.7 Downstream of boundary trap
Drains downstream of a boundary trap shall be not smaller than DN 100.

3.3.8 Oversizing of drains
A drain shall not be increased in size unless the fixture unit loading is in excess of the maximum allowable for that size drain at a particular grade, as specified in Table 3.1.

3.3.9 Maximum length of fixture discharge pipes
The maximum length of fixture discharge pipe without venting shall be in accordance with Appendix D.
NOTES:
1. DN 65 drains may be used as branch drains only, provided that no soil fixtures (except urinals) are connected thereto.
2. 'x' indicates that the combination of nominal size and grade is not permitted.
3. Figures in brackets are the maximum fixture unit loadings for drains laid at reduced grades as permitted by Clause 3.4.2.
4. The regulatory authority may prescribe or approve the sizing and grading of any drain on the basis of observed peak flows for buildings of similar occupancy in lieu of the size determined as prescribed in this Standard.
5. Appendix B provides a table for conversion of grades as a percentage to grades as a ratio.
### 3.4 GRADES OF DRAINS

The normal minimum grade of vented and unvented drains shall be as given in Table 3.2.

#### 3.4.1 Minimum grade

The minimum grade of drains shall be as given in Table 3.2.

#### 3.4.2 Reduced grades

Where the minimum gradient, as specified in Table 3.2, cannot be obtained, drains may be laid at the reduced grades given in Table 3.3.

Where soil fixtures are connected, the fixture unit loading on the drain shall be not less than the appropriate value given in Table 3.3. If this loading cannot be achieved, provision shall be made for flushing the drain.

#### TABLE 3.2

<table>
<thead>
<tr>
<th>Nominal size DN</th>
<th>Minimum grade, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>2.50</td>
</tr>
<tr>
<td>80</td>
<td>1.65</td>
</tr>
<tr>
<td>100</td>
<td>1.65*</td>
</tr>
<tr>
<td>125</td>
<td>1.25</td>
</tr>
<tr>
<td>150</td>
<td>1.00</td>
</tr>
<tr>
<td>225</td>
<td>0.65</td>
</tr>
<tr>
<td>300</td>
<td>0.40</td>
</tr>
</tbody>
</table>

* Except for drains from septic tanks, sewage treatment plants and unvented discharge pipes from tundishes, which may have a minimum grade of 1.00%.

NOTE: Appendix B provides a Table for conversion of grades as a percentage to grades as a ratio.

#### TABLE 3.3

<table>
<thead>
<tr>
<th>Reduced grade %</th>
<th>Nominal size of drain, DN</th>
<th>80</th>
<th>100</th>
<th>125</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.45</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.25</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.10</td>
<td>x</td>
<td>x</td>
<td></td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>1.00</td>
<td>x</td>
<td>x</td>
<td>38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.85</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>0.65</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>160</td>
</tr>
</tbody>
</table>

**NOTES:**

1. 'x' indicates that the grade is not permitted for this size.
2. '—' indicates that the grade is permitted by Table 3.2 for this size (i.e., not reduced grade).
3. Appendix B provides a table for conversions of grades as a percentage to grades as a ratio.
3.4.3 Steep grades
Where it is necessary to install a drain on a grade between 20% and vertical, anchor blocks shall be installed—
(a) at the bend or junction at the top and bottom of the inclined drain; and
(b) at intervals not exceeding 3 m.

3.4.4 Anchor blocks
Anchor blocks for drains up to DN 150 shall be of reinforced concrete having two reinforcing rods of not less than 9 mm diameter. The reinforcing rods shall be bent to a radius that is 100 mm greater than the outside diameter of the pipe (see Figure 3.2). Anchor blocks shall—
(a) be not less than 150 mm in thickness;
(b) extend across the full width and be firmly keyed into the sides of the trench;
(c) extend above the top of the pipe to a minimum height of 150 mm;
(d) extend below the base of the trench for a minimum depth of 150 mm; and
(e) not cover any flexible joint.

FIGURE 3.2 ANCHORING OF DRAINS

3.5 LAYING OF DRAINS

3.5.1 General
Where a drain is to be located in an open cut trench that is in a road, easement, public place or the like, it shall be installed in accordance with the following:
(a) Where the full depth at the point of connection is not required to drain the property, a jump-up shall be installed either at the point of connection or within the property boundary.
3.4.2 Separation from above ground electrical conduit, wire, cable, consumer gas or water pipes

The separation shall be at least 100 mm between any discharge pipes and any above-ground—

(a) electrical conduit;
(b) electrical wire or cable;
(c) consumer gas pipes; or
(d) water services.

3.4.3 Separation from underground electrical supply cables or consumer gas pipes

(a) The separation between any underground drain and an electrical supply cable shall be at least—

(i) 100 mm, provided the electrical supply cable is indicated along its length with orange marker tape complying with AS/NZS 2648.1 and is mechanically protected; or
(ii) 600 mm where the electrical supply cable is neither indicated nor protected.

(b) The separation between any underground drain and consumer gas pipes shall be at least—
(i) 100 mm provided the consumer gas pipe is indicated along its length with marker tape complying with the requirements of AS/NZS 2648.1 laid 150 mm above the installed pipe and is mechanically protected; or

(ii) 600 mm where the consumer gas pipe is neither indicated nor mechanically protected.

NOTES:
1 Mechanical protection is provided by any of the following: concrete slabs, continuous concrete pour, bricks designed for protecting electrical supply cables.
2 For clearance from a communication cable, see Clause 3.6.4.

3.6.4 Separation from underground electrical earthing electrode

The separation between any underground drain and an electrical earthing electrode, for an electrical supply not exceeding 1000 V, shall be at least 500 mm. For an electrical supply exceeding 1000 V, the relevant regulatory authority shall be contacted for a ruling.

3.6.5 Separation from underground communication cable

The separation between any underground drain and a communication cable shall be at least 100 mm.

3.6.6 Separation from other underground services

The separation between any underground drain and any other service other than consumer gas piping, electrical communication service or water service shall be at least 100 mm or 300 mm from a stormwater drain exceeding DN 100 (see Figure 3.3).
3.6.7 Crossover of underground services

Any underground drain crossing a service or any underground service crossing a drain shall—

(a) cross at an angle of not less than 45°;
(b) have a vertical separation of not less than 100 mm; and
(c) be marked along its length for 1 m either side of the centre-line of the service with marker tape complying with AS/NZS 2648.1 laid 150 mm above the installed service.

3.6.8 Clearance from underground obstructions

Drains shall be installed with sufficient clearance to any underground obstruction to protect the drain from physical damage and to permit repairs. The clearance shall be at least 100 mm.

NOTE: For drains in proximity to footings and foundations, see Clause 3.8.

3.7 DEPTH OF COVER

3.7.1 General

Drains shall be laid in a manner that provides protection against mechanical damage and deformation due to vehicular loadings.

3.7.2 Depth of cover in public areas and private areas

Drains shall be installed with a depth of cover, measured from the top of the pipe socket or inspection opening to the finished surface level, as specified in Table 3.4, unless the product-specific Standard specifies, or the manufacturer recommends, a greater depth of cover.

TABLE 3.4
MINIMUM COVER IN PUBLIC AND PRIVATE AREAS FOR BURIED PIPES

<table>
<thead>
<tr>
<th>Location</th>
<th>Minimum depth of cover, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cast iron and ductile iron</td>
</tr>
<tr>
<td>Subject to vehicular traffic</td>
<td>300</td>
</tr>
<tr>
<td>All other locations</td>
<td>Nil</td>
</tr>
</tbody>
</table>

*Except as provided in Clauses 3.7.3 and 3.7.4

3.7.3 Drains installed with less than minimum cover

Drains constructed of materials having less than minimum cover as specified in Table 3.4, or less than the manufacturer’s installation recommendations, shall be covered by at least 50 mm of overlay and then shall be paved with—

(a) 100 mm minimum thickness of reinforced concrete, where subject to heavy vehicular loading;
(b) 75 mm minimum thickness of brick or concrete paving, where subject to light vehicular traffic; and
(c) 50 mm minimum thickness of brick or concrete paving, where not subject to vehicular traffic.

The paving shall extend the full width of the trench, or the drain shall be adequately protected from mechanical damage.

NOTE: Also refer to the manufacturer’s recommendation.
3.7.4 Drains under buildings

Drains below ground and under buildings may be laid with less than the minimum cover specified in Table 3.4, provided that—

(a) 25 mm of overlay separates the drain from a reinforced concrete slab; or

(b) the drain is adequately protected from mechanical damage and superimposed loads.

3.8 BUILDING OVER DRAINS

3.8.1 Alterations and additions to buildings

The footings for alterations or additions to buildings shall not be placed over or adjacent to existing drains until the clearances specified in Clause 3.8.2 have been provided. Alternatively, such drains shall be relocated.

Any existing gully, inspection shaft, or boundary trap riser shall not be permitted to remain under any such alterations or additions other than where specifically permitted in Clause 4.4.2.3, Clause 4.6.5 or Clause 4.6.6.5.

3.8.2 Installation near and under buildings

The following applies to drains in close proximity to footings or foundations:

(a) Where a drain passes under a strip footing, its angle of intersection with the footing in the horizontal plane shall be not less than 45°, and the minimum clearance between the top of the drain to the underside of the footing shall be 25 mm.

(b) Drains laid through footings or walls, other than below-ground external walls, shall be installed with an annular space of not less than 25 mm filled with a liner of flexible material.

(c) Pipes may be laid through below-ground external walls provided—

(i) two flexible joints are provided externally within 800 mm of the external face of the wall, and such joints are not less than 600 mm apart; and

(ii) the penetration of the wall is made watertight.

(d) Where a drain is installed parallel to a footing, the trench shall be located as follows:

(i) In Australia—

(A) for single dwellings, as shown in Figure 3.4; and

(B) for all other buildings or where the requirements of Item (A) cannot be achieved, a recognized expert shall be engaged to provide a design in accordance with the PCA.

(ii) In New Zealand, as specified in NZBC Clause G13/AS2.

(c) Requirements for pile systems shall be determined by a suitably qualified expert as recognized so by the jurisdiction having authority.

3.8.3 Fixture connections to vitrified clay drains under buildings

Where a riser of vitrified clay material is installed for the purpose of connecting a fixture, it may be extended up to 1 m above ground surface provided that—

(a) the spigot end of the riser is below ground;

(b) only the socket of the exposed pipe extends above floor level; and

(c) the exposed pipe is protected from damage.

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3.9 VENTING OF DRAINS

3.9.1 General

Vents in drains shall be provided—

(a) at both ends of any drain that incorporates a boundary trap;
(b) at the upstream end on any drain not incorporating a boundary trap;
(c) at the upstream end of any branch drain to which a fixture trap or floor waste gully is connected, if the distance from the weir of the trap to the vented drain exceeds 10 m;
(d) at the upstream end of a branch drain to which a gully is connected, or a sullage dump point located in a caravan park is connected, if the distance from the weir of the trap to the vented drain exceeds 10 m;

* Most sand and rock sites with little or no ground movement from moisture changes.
† Sites include soft soils, such as soft clay or silt or loose sands; landslip, mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise.

NOTE: This Table has been adapted from the BCA Housing Provisions and users of this Standard should satisfy themselves that the Table is still relevant and has not been amended.

FIGURE 3.4 EXCAVATION NEAR FOOTINGS
(c) at the upstream end of any DN 100 branch drain to which three or more water closet pans are connected;

(f) along the line of a DN 100 vented drain where 10 or more water closet pans are installed in a toilet block and are each individually connected in accordance with Clause 3.9.3.4; and

(g) in accordance with Clause 3.18 (d) for drains connected to vacuum sewerage systems.

NOTE: Where air admittance valves are used, see Clause 6.9.

3.9.2 Location

3.9.2.1 Upstream vent

The upstream vent on any drain shall be connected—

(a) to the drain downstream of any fixture or drainage trap connection, provided any unvented section of drain upstream of the vent branch connection complies with Clause 3.10.3; or

(b) at the vent extension of a stack located at or near the upstream end of the drain, provided any unvented section of drain upstream of the stack branch connection complies with Clause 3.10.

3.9.2.2 Downstream vent

The downstream vent on any drain, where required by Clause 3.9.1 (a), shall be connected within 10 m of the boundary trap riser provided no other fixture is connected between the boundary trap riser and the vent connection.

3.9.2.3 Low level vent (ground vent)

Where a low level vent is provided in accordance with Clause 3.9.2.2, it shall be located so that—

(a) the inlet of the vent is not less than 150 mm above ground level;

(b) it terminates not less than 3 m from any opening into a building or 5 m from any air duct intake; and

(c) it is not liable to be damaged or cause injury or obstruction.

3.9.3 Size of drainage vents

3.9.3.1 Minimum size

Drainage vents shall be sized in accordance with Table 3.5, and—

(a) the upstream vent on any main drain shall be not less than DN 50;

(b) the upstream vent on any branch drain shall be not less than DN 40;

(c) the section of drain acting as a vent shall be not less than DN 65 (see Figure 3.5);

(d) notwithstanding the number of fixture units discharging to the drain, the minimum size of any ground vent pipe shall be DN 50; and

(e) if an air admittance valve is used to terminate an upstream vent, Table 6.6 shall apply.

NOTE: Branches connected into a positive pressure area, such as near boundary traps in multistorey buildings, may need additional venting.

3.9.3.2 Rating of vents

Where two or more vents are directly connected to a drain, these vents may take the place of the single vent required by Table 3.5, provided the sum of the ratings is equal or greater than the vent rating for the single vent (see Figure 3.5(A)).
TABLE 3.5
SIZE AND RATING OF VENTS

<table>
<thead>
<tr>
<th>Size of vent pipe DN</th>
<th>Fixture units discharging to drain</th>
<th>Vent rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>&gt;1</td>
<td>≤10</td>
</tr>
<tr>
<td>50</td>
<td>&gt;10</td>
<td>≤30</td>
</tr>
<tr>
<td>65</td>
<td>&gt;30</td>
<td>≤175</td>
</tr>
<tr>
<td>80</td>
<td>&gt;175</td>
<td>≤400</td>
</tr>
<tr>
<td>100</td>
<td>&gt;400</td>
<td>—</td>
</tr>
</tbody>
</table>

3.9.3.3 Connection of vent to drain

Where the minimum size of DN 65 for a drain line exists, a minimum DN 50 vent pipe may be connected as shown in Figure 3.5.

‘Text deleted’

![Figure 3.5 Typical Connection of Vent to Drain](image)
Example:  
Total loading units discharging to drain = 36 FU.  
Required size of drainage vent = DN 65—(Rating of 2) refer to Table 3.5.  
The two other stack or drainage vents (assuming the branch drain is over 10 m) in combination may take the place of a single DN 65 or DN 50 vent.  
NOTE: The section of drains to be vented shall not be reduced below the rating of venting required.

FIGURE 3.5(A) TYPICAL EXAMPLE OF VENT SIZING

3.9.3.4 Water closet pans in toilet blocks

Water closet pans connected to a DN 100 drain in toilet blocks shall be vented in accordance with the following:

(a) The vents shall be positioned to divide the water closet pans into approximately equal groups.

(b) Where 10 or more water closet pans, in any ground-floor toilet block, are each separately connected to a vented drain, and the spacings of respective branch drain connections to the vented drain are such that they are 2 m apart or less, one DN 50 vent located between last and second last pan shall be provided for the first 10 pans and an additional DN 50 vent shall be provided for each additional 10 pans or part thereof.

(c) Where practicable, each vent shall branch from the vented drain, or otherwise from a water closet pan branch.

3.10 UNVENTED BRANCH DRAINS

3.10.1 General

The requirements of this Clause shall apply to—

(a) ground-floor connections to a vented drain installed on grade, located below or above the ground (see Clause 9.12); or

(b) connections to a disconnector or overflow relief gully.

3.10.2 Sizing

The size of an unvented branch drain shall be such that the sum of the fixture unit ratings, as given in Table 6.1, shall not exceed the maximum loading specified in Table 3.6.
3.10.3 Maximum length

The total length of an unvented branch drain, including the length of the fixture discharge pipe (see Figure 3.6), shall be no greater than the following:

(a) 10 m from the vented drain to the weir of the trap, provided the length of the discharge pipe does not include a vertical drop, between the crown of the trap and the invert of the branch drain exceeding—
   (i) 2 m for water closet pans with DN 80 discharge pipes;
   (ii) 1.5 m, for basins and bidets fitted with 'S' traps; and
   (iii) 2.5 m for all other fixtures.

(b) 10 m to the weir of a disconnector gully.

(c) 10 m to a sullage dump point located in a caravan park.

3.10.4 Vertical sections

Where the fixture discharge pipe is the same size as the unvented branch drain to which it connects, the drain to the trap shall have a maximum of two vertical jump-ups, each not exceeding 2 m in height, and separated by not less than 300 mm of graded pipe.

3.10.5 Connection of fixture discharge pipes

Where fixtures are connected to unvented branch drains, the requirements for the fixture discharge pipes shall be the same configuration as for the connection of fixtures to group vented branches and shall comply with Clauses 7.5.7.5.4 and 7.5.7.5.5 and Figure 3.6.

### TABLE 3.6
SIZE OF UNVENTED BRANCH DRAINS

<table>
<thead>
<tr>
<th>Size of pipe DN</th>
<th>Maximum fixture unit loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>5 fixture units (excluding a water closet pan or slop hopper), or 10 fixture units from one floor waste gully</td>
</tr>
<tr>
<td>80</td>
<td>12 fixture units (including not more than one water closet pan or slop hopper)</td>
</tr>
<tr>
<td>100</td>
<td>30 fixture units (including not more than two water closet pans or 2 slop hoppers)</td>
</tr>
</tbody>
</table>
3.11 UNVENTED DRAINS DISCHARGING TO GULLIES

3.11.1 General

A drain that receives the discharge from waste fixtures only may be connected to a gully.

The maximum fixture unit loading and size of unvented branch drain shall comply with Table 3.6.

3.11.2 Length of unvented section

The combined length of unvented drain and fixture discharge pipe shall not exceed 10 m. The fixture discharge pipe shall comply with Clauses 3.10.3 and 3.10.5. If the combined length of the unvented drain and fixture discharge pipe exceeds 10 m, the branch line shall be vented in accordance with Clause 3.9.2 or Clause 6.9.
3.12 INLET PIPE TO DISCONNECTOR GULLY

Where the inlet pipe to a disconnector gully is DN 65 or larger, multiple branches may be connected to such inlet pipe provided all fixture traps are within 10 m of the disconnector gully and within the fixture unit loading for pipe size and the disconnector gully.

3.13 RESTRICTION ON CONNECTIONS IN PROXIMITY TO A STACK

Discharge pipes from fixtures shall only connect to a drain in proximity to stacks in accordance with Clause 6.6 and Figure 6.4.

3.14 CONNECTION OF BASEMENT FIXTURES

Fixtures installed in basements or other locations, where surcharge could damage the premises and contents, shall be connected to the sewerage system by means of a pumping installation complying with Section 10.

3.15 CONNECTIONS IN FLOOD-PRONE AREAS

3.15.1 Inlet above flood level

In areas subject to known flooding, the inlet to a sanitary plumbing and drainage system shall be positioned at least 150 mm above the declared flood level.

3.15.2 Inlet below flood level

Where inlets to fixtures, fittings or appliances cannot be installed at a height of 150 mm above the declared flood level, they shall be connected as follows:

(a) The discharge of the fittings, fixtures and appliances shall be raised by ejector or pump complying with Section 10 to a height required by the regulatory authority and discharged into the sewer as and where directed.

(b) An automatic, float-controlled device or similar device shall be installed to ensure that the ejector or pump ceases to operate during periods of flooding.

3.16 RE-USE OF EXISTING SANITARY DRAINS

When a building containing sanitary plumbing and drainage is demolished or removed from site and a new building constructed, the following requirements shall apply to the use of existing sanitary drains up to the point of connection:

(a) Mortar-jointed vitrified clay, mortar-jointed concrete, asbestos cement and fibre-reinforced cement pipes shall not be re-used unless, where authorized by the authority having jurisdiction, they have been renovated using a structural plastics liner.

(b) Drains constructed of other authorized materials shall not be re-used unless they have been verified for compliance in accordance with the relevant clauses of this Standard and tested in accordance with Section 13 and found to be satisfactory.

Drains that do not comply shall be replaced or repaired and retested.

NOTES:

1. In the case of an existing building, where major alterations or additions that will involve additional fixtures being connected to the existing drain are to be carried out, consideration should be given to the requirements of this Clause.

2. If any section of the existing drain is found to be defective, then it should be satisfactorily repaired or a new section of drain should be installed.
3.17 DRAINS IN CARAVAN PARKS

3.17.1 General

As part of the sanitary system, caravan parks shall provide—

(a) common soil waste dump points for discharging the contents of holding-tank type toilets within caravans and relocatable dwellings; and

(b) sullage dump points for connection of waste fixtures for caravans and relocatable dwellings.

3.17.2 Soil waste dump points

At least one common soil waste dump point shall be provided in the short-term residency section of a caravan park for the disposal from relocatable dwellings of soil wastes from holding-tank type toilets, which normally contain chemicals.

The dump point shall be constructed in accordance with the following (see Figure 3.7):

(a) The concrete base shall be graded to the outlet at a grade of not less than 1 in 60.

(b) The outlet pipework may be DN 80 or DN 100.

(c) The bayonet connection shall include a sealing cap and hose coupling, and shall be at least 25 mm clear of any obstruction.
(a) Soil waste dump point

See Clause 3.17.2(a)

See Clause 3.17.2(b)

Flexible hose from chemical toilet holding tank

Bayonet connection

Cap

Bayonet coupling

Backflow prevention device (AS/NZS 3500.1)

Bip tap DN 20

Water supply DN 20

Reinforced concrete base 600 x 500

Finished ground level

Grate

Junction

Trap

NOTE: Bib tap and backflow prevention device to be provided.

DIMENSIONS IN MILLIMETRES

FIGURE 3.7 SOIL DUMP POINTS FOR CARAVAN PARKS

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3.17.3 Connection points for short-term sites

Where sullage connection points are provided to serve individual caravans or mobile home sites, they shall be constructed in accordance with Figure 3.8 or Figure 3.9.

Sullage points shall be positioned to obtain the shortest practical connection to the caravan and shall not be more than 10 m from the vented drain.

**NOTE:** Hose tap and backflow prevention device to be provided.
3.17.4 Relocatable dwellings located on long-term sites

All sanitary plumbing, sanitary drainage and water supply installations for relocatable dwellings on long-term sites shall comply with the AS/NZS 3500 series and the requirements of the regulatory authority responsible for caravan parks in the area or region.

3.18 VACUUM SYSTEMS

Drains connected to vacuum sewerage systems shall be installed in accordance with the following:

(a) An inspection shaft connected to the drain with a junction shall be placed as close as practicable to, and upstream of, the collection tank.

(b) The junction inlet to the inspection shaft shall be against the grade of the drain so that any rodding of the line is in the direction away from the collection tank.

(c) Where more than one drain is connected to a collection tank, the spill level of both overflow gullies of the drains shall be installed level with each other wherever practicable.

(d) A DN 100 open vent pipe shall be provided at the upstream end of each drain connected to the collection tank and a DN 100 downstream vent shall be located within 10 m of the collection tank. No fixtures shall be connected between the collection tank and the downstream vent connection unless otherwise authorized by the authority having jurisdiction.

NOTES:

1 In addition to the open vents, air admittance valves, installed in accordance with Clause 6.9, may be used to provide additional venting of drains connected to a collection tank.

2 Jump-ups should be avoided.
3.19 COMMON EFFLUENT DRAINAGE SYSTEM

3.19.1 General

All sanitary plumbing and sanitary drainage in common effluent drainage systems shall comply with the relevant sections of this Standard.

3.19.2 Drainage connections

Drains connected to common effluent drainage systems shall be installed in accordance with the following:

(a) Discharge from fixtures shall pass through a septic tank. Where this is impracticable due to location and available fall, discharge from waste fixtures may pass through a sullage tank.

(b) Drains from septic or sullage tanks to the common effluent drain shall be not less than DN 80 and not more than DN 100 and shall be laid at a grade of not less than 1% (1 in 100).

(c) Induct vents shall not be installed on septic tanks. Where induct vents are installed on an existing septic tank, they shall be removed before connecting the septic tank to a common effluent drainage system.

(d) Inspection openings shall be provided in accordance with Clause 4.7 and shall be included on—

(i) the inlet to an on-site wastewater treatment unit; and

(ii) the outlet of the on-site wastewater treatment unit, within 2.5 m of the tank, where the connecting drain is greater than 10 m in length.

(e) Drains, both existing and new, shall be tested in accordance with Section 13.

(f) Soakage trenches, and stormwater, roof water and subsoil water drainage shall not be connected to a common effluent drainage system.

NOTE: Typical connections are shown in Figures 3.10, 3.11, 3.12 and 3.13.
FIGURE 3.10  TYPICAL SITE LAYOUT PLAN SHOWING CONNECTION DETAILS FOR AN ALL-WASTE SEPTIC TANK SYSTEM

Depth and location of connection point obtained from the network utility operator.

Existing 3000 L precast septic tank to be cleaned out and inspected.

Access cover shafted to surface level.

DN 100 inspection opening

DN 100 inspection opening

Distribution sump to be disconnected and removed.

Induct vents to be removed and openings below the surface to be sealed.

Disconnect existing effluent soakage trench system.

Existing soakage trenches.
FIGURE 3.11  TYPICAL CONNECTION OF SEPTIC TANK TO COMMON EFFLUENT DRAIN (EXISTING ALL-WASTE SEPTIC TANK INSTALLATION ONLY)
ON 100 inspection opening required within 2.5 m of septic tank outlet where connection length exceeds 30 m. Additional inspection shafts required at a minimum spacing of 30 m thereafter.

DN 100 drainage min. grade 1% (1:100)

Inspection shaft within 1.5 m of the boundary where no connection inspection shaft provided by network utility operator.

Depth and location of connection point obtained from the network utility operator.

FIGURE 3.12 TYPICAL CONNECTION DETAILS FOR AN ALL-WASTE SEPTIC TANK SYSTEM
3.19.3 Septic tanks

Septic tanks, as part of the common effluent drainage system, shall be sized, constructed and installed in accordance with AS/NZS 1546.1.

Septic tanks shall be inspected for soundness and hydrostatically tested before connection to the common effluent drain.

NOTE: In Australia, effluent dispersal should be in accordance with health regulator’s requirements.
3.19.4 Sullage tanks

Sullage tanks shall be sized, constructed and installed in accordance with AS/NZS 1546.1.

Sullage tanks shall be inspected for soundness and hydrostatically tested before connection to the common effluent drainage system.

NOTES:

1. The satisfactory performance of common effluent drainage systems is dependent on regular cleaning out and desludging of each septic tank and sullage tank, which should be done once every five years, or sooner, if necessary.

2. The connecting drain from the septic tank to the common effluent drain may require flushing from time to time. It is essential that a mobile water tank be used to perform the flushing operation as no direct connection to a town supply is permitted.

3. ‘Text deleted’

3.20 ON-SITE WASTEWATER TREATMENT UNITS

On-site wastewater treatment units shall be installed in accordance with AS/NZS 1546.1, AS/NZS 1546.2 or AS/NZS 1546.3, as appropriate.
SECTION 4 DRAINAGE SYSTEM

4.1 SCOPE OF SECTION
This Section specifies requirements for components of sanitary drainage systems.

4.2 POINT OF CONNECTION

4.2.1 General
Drains connected to the network utility operator's sewer shall be not less than DN 100.

NOTES:
1. When connecting fixtures that operate to a sewer by gravity, care should be taken to ensure that the flood level rim of the lowest fixture or trap is of adequate height above the soffit of the sewer so as to avoid the sewer discharging onto the property under normal operating conditions.
2. Where the height of the lowest fixture or trap in Note 1 cannot be achieved, then consideration should be given to the lowest fixture or trap discharging to the sewer—
   (a) through a reflux valve in accordance with Clause 4.5; or
   (b) by means of a sewage ejector or pump, complying with Section 10.
3. Where a sanitary drain is to connect to a network utility operator's sewer, information relating to any restrictions regarding soffit requirements and the point of connection should be obtained from the network utility operator prior to commencing any design.

4.2.2 Protection of sewers
Whenever drainage works are carried out, necessary measures shall be taken to protect the network utility operator's sewers from damage and to prevent the entry of—
   (a) extraneous water;
   (b) soil, sand or rock;
   (c) the contents of any septic tank; or
   (d) any other substance, the discharge of which would impede the operation of the sewer.

4.2.3 Tidal or water-charged locations
Where a point of connection is provided in ground affected by tidal water or a high water table, the connection shall be made so as to prevent the ingress of water to the sewer.

4.3 DRAINS

4.3.1 Below ground
Drains below ground shall—
   (a) be laid to an even grade, be straight and have no lipped joints or internal projections;
   (b) have a minimum number of changes of grade and direction;
   (c) be sized in accordance with the fixture unit loading given in Table 3.1;
   (d) be continuously supported under the barrel, other than for cast iron and ductile iron pipes and fittings;
   (e) be protected against damage;
   (f) be watertight;
   (g) have the interior of each pipe cleared of any foreign matter before it is laid and prior to commissioning; and
4.3.2 Above ground under buildings

Drains may be installed above ground under buildings as follows:

(a) The installation shall comply with the other relevant requirements of this Section.
(b) The drain shall be adequately protected from mechanical damage.
(c) Support and fixing shall comply with Clause 9.2.
(d) Provision for expansion shall be made appropriate to materials and their application.
(e) The drain shall satisfy the requirements of Clause 3.6 as appropriate.

4.3.3 Changes of direction

Changes of direction or gradient in drains shall be effected by the use of bends or junction fittings, or at inspection chambers.

4.3.4 Maximum length of fixture discharge pipes

The maximum length of fixture discharge pipe without venting shall be in accordance with Appendix D.

4.4 INSPECTION SHAFTS AND BOUNDARY TRAPS

4.4.1 General

The main drain shall be provided with either an inspection shaft in non-boundary trap areas, or a boundary trap in boundary trap areas, located at or near the point of connection to the sewer.

Inspection shafts and boundary traps located in an area that is subject to flooding shall comply with the requirements of the relevant authority.

4.4.2 Inspection shafts and boundary trap risers

4.4.2.1 Installation

The inspection shafts and boundary trap risers shall comply with the following:

(a) They shall terminate at or near ground or surface level with a removable airtight inspection cap of the same diameter as the shaft or riser. In the case of boundary trap risers a low level vent shall be installed in accordance with Clause 3.9.2.3.
(b) The cap shall be suitably sealed into the shaft or riser.
(c) Where the inspection shaft or boundary trap riser is likely to be damaged by vehicular traffic, the cap may be installed below surface level. Access shall be provided in accordance with the following:
   (i) A heavy-duty trafficable cover shall be installed at surface level above and independent of the cap.
   (ii) The cover shall be suitably supported so that no load can be transmitted onto the shaft.
   (iii) The shaft shall be terminated just below the underside of the cover.
4.4.2.2 Location

The inspection shaft or boundary trap riser shall be located—
(a) wholly within the property served;
(b) as close as practicable to the boundary;
(c) clear of all authority easements;
(d) as near as practicable to the point of connection;
(e) in the open air, except as provided in Clause 4.4.2.3;
(f) in an accessible position; and
(g) so that the inspection cap is not covered from view, except as allowed in Clause 4.4.2.1(c).

4.4.2.3 Alternative locations

Where the requirements of Clause 4.4.2.2 cannot be met, an inspection shaft and boundary trap riser may be sited at other locations as follows:

(a) Under cover An inspection cap may be installed under a roofed area. The cap shall—
   (i) be located at floor or ground level; and
   (ii) be readily accessible for inspection, rodding and plunging with not less than 1 m clear space vertically above the inspection cap.

(b) In a recess If all or part of a building is constructed up to the boundary of the property, and if this makes it impracticable to site the inspection cap in the open air or within a building under cover, the inspection cap may be installed within a recess constructed in the wall of the building, providing the following requirements are met:
   (i) The inspection cap shall be airtight.
   (ii) The recess shall be constructed to provide a clear space of at least 1 m above the inspection cap.
   (iii) At least 100 mm clear space shall be provided on each side and to the rear of the inspection cap.
   (iv) The recess shall have a removable panel.

4.4.3 Installation of inspection shafts

4.4.3.1 General

Inspection shafts shall be provided at the lower downstream end of a drain in accordance with the following:

(a) A junction shall be installed in the graded drain with the branch of the junction extended vertically upwards to the surface to form a shaft.

(b) Where a jump-up is constructed within a property and is not more than 3 m from the point of connection, the jump-up shall be extended upwards to the surface level to form a shaft.

(c) No branch drain or fixture discharge pipe shall be connected to an inspection shaft where the shaft is constructed from a square junction installed in a graded drain.

(d) The jump-up shall be supported by placing a concrete footing not less than 100 mm thick under the bend, with a width of not less than 100 mm beyond the sides of the shaft, and extending up to the centre-line of the drain.
An inspection chamber with an open channel or maintenance shaft in accordance with AS/NZS 4999 may take the place of an inspection shaft.

4.4.3.2 Size
Inspection shafts shall be—
(a) the same size as the drain for drains up to DN 150;
(b) not smaller than DN 150 for drains larger than DN 150; or
(c) the same size as the jump-up where an inspection shaft is constructed by extending a jump-up.

4.4.4 Installation of boundary traps

4.4.4.1 Outside buildings
Boundary traps located outside buildings shall be installed in accordance with the following:
(a) Where the point of connection is provided in a vertical section of the sewer within the property, a boundary trap shall not be installed in the same trench as the sewer jump-up.
(b) A downstream vent complying with Clause 3.9.2.2 shall be installed at the boundary trap riser.
(c) Boundary traps of materials, other than cast iron, shall be directly supported on a solid foundation by placing under the trap a concrete pad that shall—
   (i) be not less than 100 mm thick; and
   (ii) extend upwards to the inlet socket of the trap.
(d) The shaft shall be protected and supported during the installation and placement of backfilling.

4.4.4.2 Inside buildings
Boundary traps located inside buildings and installed above the ground or floor surface shall be—
(a) protected against mechanical damage;
(b) located as close as practicable to and within the boundary line; and
(c) supported independently of the drain.

4.4.4.3 Size
The size of the boundary traps and risers shall be not smaller in size than the drain that discharges to it, or smaller than DN 100.

4.5 REFLUX VALVES

4.5.1 Location
A reflux valve shall be located wholly within the property and be accessible.

NOTE: This can be achieved by using either an access chamber or a riser shaft to the finished surface level.

4.5.2 Installation
A reflux valve shall be installed where either—
(a) the minimum height of the overflow relief gully and the lowest fixture specified in Clause 4.6.6.6 cannot be achieved; or
4.5.3 Surcharging sewer

Where surcharge is likely to occur and a reflux valve is to be installed, it shall be located in accordance with the following:

(a) Where the drain has an inspection shaft, the reflux valve shall be installed adjacent to the shaft.

(b) Where the drain has a boundary trap, the reflux valve shall be located immediately downstream from and adjacent to the outlet of the boundary trap.

4.5.4 Reflux valve chambers

Except where a reflux valve is installed in an accessible position within a building (see Clause 9.13.2), or can be fully serviced and maintained from ground level, all reflux valves shall be installed within a chamber complying with Clause 4.8.

4.6 GULLIES

4.6.1 General

Gullies may be used for one or more of the following purposes:

(a) As relief in the event of sewage surcharge (overflow relief gully).

(b) To provide disconnection between waste discharges and the remainder of the sewerage installation (disconnecter gully).

4.6.2 Installation

Gullies shall—

(a) be of the self-cleansing type;

(b) have the top of the gully riser provided with a grating to relieve surcharge; and

(c) where installed below ground—

(i) be supported on a concrete footing of a thickness not less than 100 mm, with a width not less than 100 mm beyond the sides of the trap and extending upwards to not less than 100 mm above the base of the gully; and

(ii) have the top of the gully riser protected from damage at finished surface level by means of a concrete surround or other authorized product.

4.6.3 Maintenance of water seal

The water seal shall be permanently maintained in a gully (see Figure 4.1 for two examples) by—

(a) the discharge from a waste fixture or floor waste gully in accordance with Table 4.1;

(b) the discharge from a waste stack of not more than five floors in height;

(c) water from a hose tap located a minimum of 450 mm above the grating where no wastepipe discharges into gully;

(d) the discharge from temperature/pressure-relief valves and/or expansion control valves;

NOTE: For temperature limitations, see Clause 2.3(c).

(e) the discharge from a charge pipe in accordance with Figure 4.3 and Clause 4.6.8; or

(f) discharges from refrigeration condensate lines.
**TABLE 4.1**

CONNECTION OF FIXTURES TO DISCONNECTOR GULLIES

<table>
<thead>
<tr>
<th>Fixture</th>
<th>Maximum unvented length of wastepipe (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basin or bidet with DN 40 traps and wastepipes</td>
<td>3.5</td>
</tr>
<tr>
<td>All other waste fixtures and floor waste gullies with DN 50 or smaller</td>
<td>6</td>
</tr>
<tr>
<td>Floor waste gullies and fixtures with DN 65 or larger wastepipes</td>
<td>10</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Bends to be kept to a minimum.
2. For New Zealand, bidets do not discharge to disconnector gullies.

**4.6.4 Prohibited discharge**

Discharges from soil fixtures shall not connect, either directly or indirectly, to a disconnector or overflow relief gully. Surface water or roof water shall not enter any sanitary plumbing and drainage system, unless authorized to by the authority having jurisdiction.

**4.6.5 Disconnector gullies inside buildings**

A disconnector gully may be located within a building provided—

(a) the gully riser extends to the finished surface level and is sealed with a removable airtight cover;

(b) a DN 50 vent pipe, branching from the riser pipe or a fitting, extends at a grade of not less than 1.25% and terminates with a grating at an external wall of the building—

(i) above the overflow level of the lowest internal fixture connected to the sealed disconnector gully;

(ii) at least 75 mm above the finished surface level; and

(iii) in areas likely to be inundated, in compliance with Clause 4.6.6.8;

(c) fixtures or appliances are not connected to the vent pipe; and

(d) air admittance valves are not used to vent sealed disconnector gullies.

Where it is not practicable to extend the vent to an external wall, the vent may terminate in the atmosphere external to a building in accordance with Clause 6.8.4.

**4.6.6 Overflow relief gullies**

**4.6.6.1 General**

At least one overflow relief gully shall be installed in the drain except as provided in Clause 4.6.6.2. Disconnector gullies complying with the requirements of Clauses 4.6.6.3 to 4.6.6.7 may be used as overflow relief gullies. For multi-unit developments, see Section 12.

**4.6.6.2 Permitted omission**

An overflow relief gully may be omitted where—

(a) the drain serves fixtures in a separate toilet block or an amenities building, which is owned or maintained by a council or similar authority, and is located in a park or reserve, provided that the floor of the building is graded to fall towards an external doorway;
(b) the site is entirely built on and it is not possible to locate the gully in any of the alternative locations specified in Clause 4.6.6.5, and the fixtures on the ground floor discharge through a reflux valve to the sewer by gravitation;

(c) the lowest fixtures connected are located on floor levels that are 3 m or more above ground surface level at the point of connection to the sewer; or

(d) an alternative overflow relief point(s), equal to or the equivalent cross-section area of the drain served, is provided to the drainage systems.

4.6.6.3 Size

The size of overflow relief gullies shall be determined from the size of the largest section of the main drain as given in Table 4.2.

**TABLE 4.2**

<table>
<thead>
<tr>
<th>Size of main drain DN</th>
<th>Size of gully outlet DN</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 and 150</td>
<td>100</td>
</tr>
<tr>
<td>&gt;150</td>
<td>150</td>
</tr>
</tbody>
</table>

4.6.6.4 Location

The overflow relief gully shall be located—

(a) within the boundaries of the property;

(b) external to the building;

(c) so that the top of the gully is accessible and positioned where any discharge will be noticeable; and

(d) with clear access for more than 2 m above the top of the gully grate, and not be enclosed.

4.6.6.5 Alternative locations

Where it is not possible to comply with Clause 4.6.6.4, an overflow gully may be located as follows:

(a) Recessed within an external wall [see Figure 4.1(b)], provided—

(i) the recess is not less than 300 mm wide and 600 mm high, measured above the top of the gully riser;

(ii) the centre of the riser is no more than 300 mm from the face of the building and the riser is fully accessible; and

(iii) the base of the recess is graded away from the building.

(b) Located within a building, (see Figure 4.1(a)) provided—

(i) the gully riser extends to floor level and be sealed with a removable airtight cover;

(ii) an overflow pipe of the same size as the gully riser is installed at a grade of not less than 1.25% and terminates in the open air at an external wall of the building in accordance with Clauses 4.6.6.6 and 4.6.6.7, and areas affected by flooding comply with Clause 4.6.6.8;

(iii) the overflow pipe is provided with a perforated removable or hinged cover that will not restrict discharge under surcharge conditions; and
(iv) fixtures or appliances are not connected to the overflow pipe.

NOTE: Additional gullies may be installed—
(a) to receive the discharge from a domestic swimming pool;
(b) on installations that serve multiple residential buildings and which have separate yards provided for each occupancy;
(c) where a lower building may be affected by surcharge from a higher building;
(d) where a lower fixture in a building may be affected by surcharge from higher fixtures; or
(e) where such gullies need not comply with the requirements of Clause 4.6.6.6.
4.6.6.6 Height of overflow point below lowest fixture

A minimum height of 150 mm shall be maintained between the top of the overflow gully riser and the lowest fixture connected to the drain.

This height shall be measured vertically from the overflow level of the gully riser, or from the invert level of the overflow pipe, to the appropriate point given in Table 4.3.
4.6.6.7 *Height above surrounding ground*

The minimum height between the top of the overflow gully riser, or the invert of the overflow pipe, and the finished surface level shall be 75 mm, except where the gully riser is located in a path or a paved area, where it shall be finished at a level so as to prevent the ponding and ingress of water.

<table>
<thead>
<tr>
<th>TABLE 4.3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POINT OF MEASUREMENT ON FIXTURES FOR HEIGHT ABOVE OVERFLOW GULLY</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fixture</th>
<th>Point of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil fixture with an integral trap</td>
<td>Top surface level of the water seal</td>
</tr>
<tr>
<td>Floor waste gully or shower</td>
<td>Top surface level of the grate</td>
</tr>
<tr>
<td>Soil fixture located in an outbuilding or room, the flow of which is graded to an external doorway</td>
<td>Overflow rim of the fixture</td>
</tr>
<tr>
<td>Other fixtures (includes greywater diversion devices)</td>
<td>Top surface level of the fixture outlet</td>
</tr>
</tbody>
</table>

NOTE: Floor waste gullies (including those in shower areas) that have a non-return valve fitted to prevent overflow may be excluded provided that the top of the gully connected to the drain terminates at least 50 mm below such floor waste gullies.

4.6.6.8 *Height in flood-affected areas*

The top of the gully riser in flood-affected areas shall be—

(a) finished at a level not less than 150 mm above the declared flood level; or

(b) sealed with a removable watertight cover with a vent of the same size as the gully, terminating at a level not less than the declared flood level and in accordance with Clause 4.6.6.6.

Where either of the above requirements cannot be achieved, no property drain shall gravitate to the network utility operator’s sewer.

4.6.7 *Floor waste gullies*

4.6.7.1 *General*

For the purpose of this Clause, floor waste gullies shall be deemed as a fixture trap (see Figure 4.2).
4.6.7.2 Permitted discharges

Fixtures listed in Table 4.4, and fixture pairs in accordance with Clause 6.4.4, may be connected to floor waste gullies and, except for tundishes, shall be located within the same room as the gully.

Basins and drinking fountains that discharge to a floor waste gully shall have a trap installed immediately adjacent to the outlet of the fixture.

NOTE: Where it is known that the discharge may cause a foaming problem, fixtures should not be connected so as to discharge through a floor waste gully.

4.6.7.3 Connection of fixtures

Each fixture, or fixture pair that is connected to a floor waste gully shall be connected by a separate wastepipe at a grade of not less than 2.5% and with a length not exceeding that specified in Table 4.4.
### TABLE 4.4
**DISCHARGE TO FLOOR WASTE GULLIES**

<table>
<thead>
<tr>
<th>Waste fixture</th>
<th>Maximum length of wastepipe, m</th>
<th>Connected to riser of floor waste gully</th>
<th>Connected to submerged inlet floor waste gully (see Figure 4.2A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixture untrapped</td>
<td>Fixture trapped</td>
<td>Fixture trapped or untrapped</td>
</tr>
<tr>
<td>Basin, drinking fountain</td>
<td>Not permitted</td>
<td>2.5</td>
<td>2.5 (trapped only)</td>
</tr>
<tr>
<td>Bath, shower/bath</td>
<td>1.2</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Bidet</td>
<td>1.2</td>
<td>2.5</td>
<td>Not permitted</td>
</tr>
<tr>
<td>Cleaners' sink</td>
<td>1.2</td>
<td>2.5</td>
<td>Not permitted</td>
</tr>
<tr>
<td>Clothes-washing machine</td>
<td>1.2</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Bar sink (commercial), glass-washing machine</td>
<td>1.2</td>
<td>2.5</td>
<td>Not permitted</td>
</tr>
<tr>
<td>Bar sink (domestic)</td>
<td>1.2</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Shower</td>
<td>1.2</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Bain-marie, sterilizer</td>
<td>1.2</td>
<td>2.5</td>
<td>Not permitted</td>
</tr>
<tr>
<td>Laundry and ablation trough</td>
<td>1.2</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Refrigerated cabinet</td>
<td>1.2</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Tundish (see Clause 4.6.7.8)</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
</tr>
</tbody>
</table>

**NOTE:** Floor waste gullies or similar traps directly connected to the drainage system and subjected to infrequent use shall be provided with an approved means of maintaining their water seals.

**FIGURE 4.2A** SUBMERGED ENTRY FLOOR WASTE GULLY

**4.6.7.4 Wastepipes discharging to floor waste gullies (FWGs)**

Wastepipes discharging to FWGs shall not be extended and trap vents shall not be installed on fixture discharge pipes.
4.6.7.5 **Prohibited location**

Floor waste gullies, with the exception of untrapped floor drains, shall not be installed in any refrigerated coolroom, airconditioning return air plenums or the like.

4.6.7.6 **Removable grate**

Floor waste gullies shall be installed with an accessible removable grate and have a riser of not less than DN 80 to finished surface level. Where the sole function of the floor waste gully is to dispose of water spillage and wash-down water, a minimum DN 50 riser may be used.

4.6.7.7 **Height of gully riser**

The height of the gully riser shall be measured from the top of the water seal to the floor surface level and shall comply with the following:

(a) For floor waste gullies with connections to the gully riser—
   (i) the minimum height shall comply with Table 4.5; and
   (ii) the maximum height shall be 600 mm.

(b) For floor waste gullies with submerged inlets, the minimum height shall be 100 mm.  
NOTE: The maximum height maybe extended to 1 m when receiving the discharges from plant rooms located above ground floor level.

| TABLE 4.5 |
| MINIMUM HEIGHT OF FLOOR WASTE GULLY RISERS |

<table>
<thead>
<tr>
<th>Waste fixtures connected to gully riser</th>
<th>Size of gully riser</th>
<th>Minimum height mm (water seal to floor level)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DN</td>
<td>88(^\circ)</td>
</tr>
<tr>
<td>All permitted waste fixtures including maximum one bath</td>
<td>80</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>150</td>
</tr>
</tbody>
</table>

4.6.7.8 **Discharges from tundishes**

In addition to the discharges permitted in Table 4.4, tundishes receiving discharges from water heater drains, airconditioning units, other condensate lines, and the like, may discharge to a floor waste gully. The maximum length of the unvented discharge pipe shall not exceed 10 m (see Figure 4.3A).
NOTES:
1 Maximum unvented length 10 m.
2 DN 50 open vent required if more than 10 m (air admittance valve not permitted).
3 Sealed disconnector gully inside building installed in accordance with Clause 4.6.5.
4 DN 100 at minimum grade 1:100.

FIGURE 4.3A TYPICAL UNTRAPPED TUNDISH CONNECTION TO SEALED DISCONNECTOR GULLY VIA SEALED FLOOR WASTE GULLY

4.6.7.9 Size of gully trap outlet
The minimum size of floor waste gully outlets shall be as specified in Table 4.6. Where the sole function of the floor waste gully is to dispose of water spillage and wash-down water, a minimum DN 50 outlet may be used.

4.6.7.10 Connection of wastepipes
Individual wastepipes shall connect—
(a) to a floor waste gully riser at an angle between 45° and 88°, as close as practicable above the water seal; or
(b) to a submerged inlet floor waste gully riser at an angle of 88°.

4.6.7.11 Size of wastepipes from fixtures
The size of wastepipes from fixtures connecting into floor waste gullies shall be as given in Table 6.1.
### 4.6.8 Charging floor waste gullies

#### 4.6.8.1 General

Where a floor waste gully is located in a position that cannot receive a waste discharge, the water seal shall be maintained by one of the following means:

(a) A charge pipe from a flushing device, connecting at the heel or the base of the flush pipe with a union. The charge pipe shall enter the floor waste gully at 45°, not less than 50 mm above the water seal and shall be silver brazed or joined by a union to the riser (see Figure 4.3(b)).

(b) A charge pipe from a tap set or a drain from a hot water relief valve, which shall drain over a tundish so that the air gap is maintained (see Figure 4.3(a)).

(c) A charge pipe extended from a mechanical or electronic trap priming device to the floor waste gully within the same room or compartment (see Figure 4.3(c)).

(d) Hose tap installed in the same room, if floor is graded to the floor waste gully.

---

**TABLE 4.6**

**FLOOR WASTE GULLY OUTLET SIZE**

<table>
<thead>
<tr>
<th>Maximum number of fixture units discharging into gully trap</th>
<th>Minimum nominal size of outlet DN</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>10 (including the discharge from not more than one bath)</td>
<td>65</td>
</tr>
<tr>
<td>15</td>
<td>80</td>
</tr>
</tbody>
</table>

NOTE: A shower outlet may be used as a floor waste gully.
4.6.8.2 Installation

The charge pipe shall be in the size range of DN 6 to DN 15.

(a) Charge pipes from flushing devices, tap sets or hot water relief valve drains shall not exceed 10 m in length.
(b) Charge pipes from mechanical priming devices shall be installed in accordance with the manufacturer's installation instructions.

NOTE: The connection of a charge pipe to a floor waste gully riser should not restrict the bore of the riser or impede access for maintenance of the gully.

4.7 INSPECTION OPENINGS (IO)

4.7.1 Location

Except where inspection chambers are provided, inspection openings for maintenance purposes (see Figure 4.4) shall be provided—

(a) outside of a building, no further than 2.5 m, along each branch drain connecting one or more water closets or slop hoppers;

(b) at intervals of not more than 30 m, with a minimum of one inspection opening on each main drain;

(c) at the connection to the network utility operator's sewer if not provided by the network utility operator;

(d) on the downstream end of the drain where any drain passes under a building except where waste fixtures only are concerned;

(e) where any new section of drain is connected to an existing drain;

(f) immediately at or upstream of the upper bend of a jump-up;

(g) at every change in horizontal direction of greater than 45° (NZ only); and

(h) at every change in gradient greater than 45° (NZ only).
4.7.2 Size
The size of inspection openings in drains shall be—
(a) the same size as the drain for those up to DN 150; or
(b) not less than DN 150 for those larger than DN 150.

4.7.3 Types
Inspection openings may be of the following forms:
(a) Inspection branches or square junctions.
(b) Inspection chambers in accordance with Clause 4.8.
(c) Reflux valves.
4.7.4 Access to inspection openings

The following applies:

(a) At least one inspection opening shall be raised to ground level or floor surface level, on each main drain.

(b) Inspection openings, where raised to ground level or floor surface, shall be provided with airtight removable caps and protected by a suitable cover and surround in such a manner that no traffic or structural loads can be transmitted to the drain.

4.7.5 Sealing

Inspection openings and unused sockets shall be sealed with plugs or caps fitted with a gasket or sealing ring of an authorized type and securely held in position by a clip or strap, or threaded connection.

When a plug or cap with a rubber ring or gasket is removed, a new rubber ring or gasket shall be fitted.

4.8 INSPECTION CHAMBERS

4.8.1 General

Inspection chambers shall be circular or rectangular in shape and either be—

(a) prefabricated; or

(b) constructed in situ from concrete at least 150 mm thick.

4.8.2 Size

The dimensions of inspection chambers shall comply with Table 4.7.

<table>
<thead>
<tr>
<th>Depth of floor of chamber</th>
<th>Rectangular</th>
<th>Circular</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Width</td>
<td>Length</td>
</tr>
<tr>
<td>Minimum internal measurements in Australia, mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;600</td>
<td>450</td>
<td>600</td>
</tr>
<tr>
<td>600 ≤900</td>
<td>600</td>
<td>900</td>
</tr>
<tr>
<td>&gt;900</td>
<td>750</td>
<td>1200</td>
</tr>
<tr>
<td>Minimum internal measurements in New Zealand, mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>&lt;1000</td>
<td></td>
</tr>
<tr>
<td>&gt;100</td>
<td>&lt;1000</td>
<td></td>
</tr>
<tr>
<td>All sizes</td>
<td>&gt;1000</td>
<td></td>
</tr>
</tbody>
</table>

4.8.3 Prefabricated chambers

Prefabricated inspection chambers shall be of a type authorized by the relevant regulatory authority.

4.8.4 Construction

4.8.4.1 Conduits and channels

Conduits and channels in inspection chambers shall be constructed in accordance with the following:

(a) The conduit in any inspection chamber located inside a building shall be fully enclosed and incorporate an inspection opening or the inspection chamber shall be provided with an approved airtight cover.
(b) The conduit in any external inspection chamber may either be enclosed as above or be an open channel of width and depth equal to the diameter of the drain.

(c) The floor in any inspection chamber shall slope towards the channel, or towards the inspection opening, on a grade of approximately 8%.

(d) Formed junctions and bends in channels shall have a centre-line radius of not less than 300 mm.

(e) A fall of at least 30 mm shall be provided in the invert of every channel that curves through 45° or more.

4.8.4.2 Jump-ups

Jump-ups at inspection chambers (see Figure 4.5) shall be as follows:

(a) Where installed in an inspection chamber, the jump-up shall be clipped to the wall and terminate at each end with a 90° bend, the higher one of which shall incorporate an inspection opening or may be a junction.

(b) Where more than one jump-up is installed in any circular inspection chamber, the chamber shall be at least 1.2 m in diameter.

4.8.4.3 Ladders

Where the depth of an inspection chamber, well or sump exceeds 1.2 m, rung-type and individual-rung ladders complying with AS 1657 and AS/NZS 4680 shall be installed, provided that—

(a) individual-rung ladders are limited to inspection chambers with a maximum depth of 3.0 m and to structures without prefabricated walls; and

(b) following manufacture, steel ladders are hot-dip zinc galvanized as specified in AS/NZS 4680.

4.8.4.4 Cement rendering

The floor and cast in situ channels of all inspection chambers shall be rendered with a coat of cement mortar at least 10 mm thick and trowelled to a smooth finish.

4.8.4.5 Top section

Inspection chambers may be constructed either full size to surface level or, at a height of not less than 1.5 m above the floor, may be tapered to an access opening, provided the access shaft is at least 600 mm in diameter and does not exceed 350 mm in length.

4.8.4.6 Access opening

A circular or rectangular access opening or access chamber at least 500 mm in size and fitted with a removable watertight cover shall be provided at surface level.

Where subject to vehicular traffic, the cover shall be adequate for the applied loading.

4.8.4.7 Construction joints

Where required, construction joints shall be provided in accordance with the following:

(a) Not more than 24 h shall elapse between successive pours of concrete.

(b) The keying surface shall be scabbled and cleaned.

(c) A cement slurry or authorized bonding agent shall be applied immediately prior to pouring concrete.

4.8.4.8 Inserts

Holes broken into, or formed in, walls of inspection chambers for insertion of pipes or fittings shall be made watertight by—
(a) keying and preparing as for construction joints, caulking the annular space between the concrete and pipe or fitting with a stiff 2:1 mix of sand-to-cement mortar; or

(b) sealing with an epoxy-based or other approved sealant.

4.8.5 Differential settlement

Where differential settlement may occur and a drain passes through the wall of an inspection chamber over 1 m deep, two flexible joints shall be provided on the drain adjacent to the wall. The length of drain between the two flexible joints shall not exceed 600 mm (see Figure 4.5).

4.9 JUNCTIONS IN DRAINS

4.9.1 Drains installed at grade

Drains shall be joined at grade to each other by means of a 45° junction and shall comply with the following (refer to Figure 4.6):

(a) Double 45° junctions and double sweep junctions shall not be used.

(b) Where a junction is used to make the connection of a branch drain to a main drain of the same size, the entry level of the branch drain may be on grade.

(c) Where unequal junctions are used, the invert of the branch drain shall be 10 mm higher than the soffit of the drain to which it connects.
FIGURE 4.5 TYPICAL JUMP-UP AT INSPECTION CHAMBERS
4.9.2 Junctions installed other than on grade

Drains installed other than on grade shall be joined by means of a sweep or 45° junction ii, where a sweep junction is used, the invert of the branch drain is at least 10 mm higher than the soffit of the main drain (see Figure 4.6A).
4.9.3 Junctions installed in vertical plane

Junctions installed in a vertical plane shall not be used for connection of stacks. Sweep and 45° junctions may be installed in the vertical plane for the connection of a single discharge pipe or a drain (see Figure 4.6), provided the following criteria are met where applicable:

(a) Only a 45° junction is used for the connection of a water closet pan.

(b) The vertical riser does not exceed 2 m in height, above the invert of the graded drain.

(c) Where the length of the branch drain connected to the vertical riser exceeds 500 mm, the branch drain is independently supported.

(d) Where a vertical riser is to be extended to finished surface level and/or the distance between the invert of the main drain and the invert of the branch drain exceeds 1 m, the junction is supported in accordance with Clause 5.3.

4.9.4 Square junctions

Square junctions in drains shall be used only—

(a) at the top of a jump-up at the point of connection;

(b) at the connection of an inspection shaft to a graded drain;

(c) at the connection of a drain to a boundary trap riser;

(d) where a vent is connected to a boundary trap riser;

(e) as the inlet riser of a gully or floor waste gully;

(f) as an inspection opening; and
(g) at the top of a jump-up in a drain, in lieu of a bend and inspection opening.

4.9.5 Junctions for stacks connected to below-ground drainage

A 45° junction installed on grade and a bend at the base of the stack, as specified in Clause 6.7.3, shall be used for the connection of a stack to a below-ground drain.

4.10 JUMP-UPS

Jump-ups in drains shall be constructed in accordance with the following:

(a) The bend at the base of the vertical section of drain shall be supported in accordance with Clause 5.3.

(b) A bend, 45° junction, square junction or a sweep junction shall be used at the top of the vertical section of drain (see Figure 4.7).

(c) The vertical section shall be protected and supported during the installation and placement of backfilling.

Branch drains connected to jump-ups shall be independently supported where the unsupported length exceeds 500 mm.
4.11 DISCONNECTION AND SEALING

4.11.1 Disconnection from the sewer

Disused drains shall be disconnected in accordance with the following:

(a) Disconnection shall be made at the point of connection to the network utility operator’s sewer.

(b) Extraneous water, soil, sand, rock or other substances shall not be permitted to enter the sewer.

(c) Where the point of connection is in water-charged ground, dewatering shall be carried out in accordance with Clause 5.2.5.

4.11.2 Sealing

Disused drains shall be disconnected as near as practicable to the drains remaining in service, which shall be made watertight using a cap or plug and sealed in a manner appropriate for the material remaining in use.
SECTION 5 EXCAVATION BEDDING SUPPORT AND BACKFILLING

5.1 SCOPE OF SECTION
This Section specifies the requirements for excavation, bedding, support and backfilling of drains. It covers pipes up to DN 225 (see also Clause 3.8.)

5.2 EXCAVATION OF TRENCHES

5.2.1 Safety
Excavation shall be conducted in accordance with workplace health and safety legislation.

5.2.2 Trench dimensions
Trenches shall be made with a minimum clearance of 100 mm on each side of the drain barrel, measured to the inside of the sheeting or side of trench. The trench width up to the level of the top of the drain shall be kept as narrow as practicable, but not less than the above minimum clearance.

5.2.3 Over-excavation
Where a trench has been excavated deeper than necessary, the excess depth shall be filled either with bedding material compacted to achieve a density as near to the original soil density as possible, or with concrete.

5.2.4 Adjacent to the sewer
Excavation by a machine shall not be carried out within 600 mm of the point of connection to the network utility operator’s sewer main.

5.2.5 Water-charged ground
Excavation in water-charged ground shall be in accordance with the following:
(a) Consideration shall be given to the effect on adjacent buildings and the trench.
(b) The water level shall be lowered below the base of the proposed trench and maintained at that level during excavation, laying of the drain and backfilling of the trench.
(c) Dewatering shall be carried out in accordance with the following:
   (i) Pumps and spearheads or similar devices may be used.
   (ii) The water removed shall be discharged into a location where it will not cause a nuisance or damage to property or the environment.
   (iii) The water removed shall not discharge, either directly or indirectly, into the sewer.

5.2.6 Shoring and underpinning buildings
Where the bottom of the trench is adjacent to or below the footing and walls of any adjoining building or structure, the advice of a suitably qualified expert shall be obtained.

If shoring and underpinning of building is necessary, it shall be carried out under the direction of a suitably qualified expert.

NOTE: For additional information, see Clause 3.8.2.
5.3 CONCRETE SUPPORT FOR DRAINS

Concrete pads used to support drains shall be a minimum of 100 mm thick and shall be laid—

(a) under gully traps and boundary traps of material other than cast iron;
(b) under all inspection junctions where a riser is brought to the surface;
(c) under all bends greater than DN 65 forming risers from the main drain;
(d) not closer than 20 mm to flexible joints.
(e) for sweep junctions, beneath the junction to a minimum thickness of 100 mm and continued up vertically to the centre of the junction fitting; and,
(f) for 45° junctions, beneath the junction to a minimum thickness of 100 mm and continued up vertically to the underside of the bend fitted to the junction fitting.

5.4 BEDDING OF DRAINS

5.4.1 General

The bed onto which drains are laid shall be adequate to continuously support the installed drain accommodating the loads from the pipeline and surrounding ground. Bedding of drains shall comply with the following:

(a) In stable soil, drains shall be laid on a bedding material in accordance with Clause 5 or shall be directly supported on the undisturbed base of the trench, provided the base of the trench is free from any rocks or tree roots.
(b) In clay, rock, shale, gravel or ground containing hard objects, drains shall be supported on a bedding material placed in the base of the trench.
(c) Ground water or surface water entering the trench shall not disturb the bedding materials.

5.4.2 Bedding materials

Filling materials used for bedding of drains (see Figure 5.1) shall be one of the following:

(a) Crushed rock, gravel screenings or similar recycled materials of nominal size of 7–10 mm.
(b) Cement mortar containing 1 part of Portland cement to 4 parts of sand by volume, thoroughly mixed with clean water to a workable consistency.
(c) Cement mortar bedding where the base of the trench is rock or shale and, where the grade is greater than 20% (1 in 5), the cement mortar shall be—
   (i) of a minimum depth of 50 mm measured below the barrel of the pipe;
   (ii) not less than 75 mm wide;
   (iii) not closer than 20 mm to flexible joints; and
   (iv) have pipes supported at not greater than 1500 mm from the centres, prior to placing the mortar bedding.
(d) Free-running sand capable of passing through a 2 mm mesh sieve, and does not contain clay, organic or any other deleterious materials.

NOTES:
1 Cast iron and ductile iron pipes may be unsupported for up to 600 mm either side of each pipe joint.
2 For installation of PVC-U pipe systems see AS/NZS 2032. For installation of polyethylene pipe systems, see AS/NZS 2033.
5.4.3 **Pipe side support and overlay materials**

Pipe side support and pipe overlay material shall not be inferior to the pipe bedding material.

5.4.4 **Bedding and backfill**

The sanitary drainage services shall be surrounded with not less than 75 mm of compacted sand, or fine grained soil, with no hard edged object permitted to come in contact with or rest against any pipe or fitting (see Figure 5.1).

Backfill shall be free from builder’s waste, bricks, concrete pieces, rocks or hard matter larger than 25 mm and no soil lumps larger than 75 mm.

![Figure 5.1 Typical Bedding of Drains](image)

**LEGEND:**
- Backfill
- Pipe overlay
- Pipe side support
- Bed zone

**DIMENSIONS IN MILLIMETRES**

**FIGURE 5.1 TYPICAL BEDDING OF DRAINS**

5.4.5 **Minimum cover**

The minimum cover requirements for bedding shall be in accordance with Clause 3.7.

5.5 **INSTALLATION OF BACKFILL MATERIALS**

5.5.1 **General**

Backfill materials shall be compacted to restore the trench as near as practicable to the normal surrounding ground surface level and reduce the likelihood of subsidence.

**NOTE:** For minimum cover, see Clause 3.7.
5.5.2 Builder's waste

Builder’s waste (e.g., bricks, concrete, steel, wood and similar waste) shall not be used as backfill material.

5.5.3 Excavated material

Excavated material from the trench may be suitable for final backfill provided it is free from rock, hard matter and organic material, and broken up so that it contains no soil lumps larger than 75 mm, which would prevent adequate compaction.

5.6 DRAINS IN OTHER THAN STABLE GROUND

Prior to the commencement of work, ground conditions shall be assessed by a suitably qualified expert. Where ground conditions may affect the performance of any plumbing or drainage installation, the method to protect the installation shall be determined by a suitably qualified expert. Soil classification reports shall be in accordance with AS 2870.

C5.6 For proclaimed mine subsidence or landslip districts, the appropriate authority should be referred to for advice of subsidence or landslip design parameters for proposed drainage systems.
SECTION 6  GENERAL DESIGN
REQUIREMENTS FOR SANITARY PLUMBING
SYSTEMS

6.1 SCOPE OF SECTION
This Section specifies requirements for all types of sanitary plumbing systems. The number of floor levels is specified in Clause 8.2.5.

6.2 FIXTURE UNIT RATINGS
Fixture unit ratings for all fixtures are given in Table 6.1. These ratings shall be used for the sizing of drains, stacks and graded discharge pipes.

6.3 VENTING FOR FIXTURES
Except for fixtures discharging to disconnector gullies (in which case Table 4.1 applies) and where the length of the fixture discharge pipe exceeds the length shown in Appendix D, a trap vent or air admittance valve shall be provided.
# Table 6.1

## Fixture Unit Ratings

<table>
<thead>
<tr>
<th>Fixture</th>
<th>Fixture abbreviations</th>
<th>Min. size of trap outlet and fixture discharge pipe DN</th>
<th>Fixture unit rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autopsy table</td>
<td>AT</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>Bain-Marie</td>
<td>BM</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>Basin</td>
<td>B</td>
<td>40</td>
<td>32</td>
</tr>
<tr>
<td>Bath (with or without shower)</td>
<td>Bth.</td>
<td>40</td>
<td>4</td>
</tr>
<tr>
<td>Bath (foot)</td>
<td>Bath (foot)</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Bath (baby)</td>
<td>Bath (baby)</td>
<td>40</td>
<td>3</td>
</tr>
<tr>
<td>Bath (shower)</td>
<td>Bath (shower)</td>
<td>40</td>
<td>4</td>
</tr>
<tr>
<td>Bedpan sterilizer</td>
<td>BPS</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>Bedpan washer</td>
<td>BPW</td>
<td>80</td>
<td>6 (F. valve)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 (Cist.)</td>
</tr>
<tr>
<td>Bedpan washer</td>
<td>BPW</td>
<td>100</td>
<td>6 (F. valve)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 (Cist.)</td>
</tr>
<tr>
<td>Bedpan washer/sterilizer</td>
<td>BPWS</td>
<td>80</td>
<td>6 (F. valve)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 (Cist.)</td>
</tr>
<tr>
<td>Bedpan washer/sterilizer</td>
<td>BPWS</td>
<td>100</td>
<td>6 (F. valve)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 (Cist.)</td>
</tr>
<tr>
<td>Bidet, bidette</td>
<td>Bid</td>
<td>40</td>
<td>32</td>
</tr>
<tr>
<td>Circular wash fountain</td>
<td>CWF</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>Clothes-washing machine—domestic commercial</td>
<td>CWM</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>Dental unit</td>
<td>DU</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>Dishwashing machine—domestic commercial</td>
<td>DWM</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>Drinking fountain</td>
<td>DF</td>
<td>40</td>
<td>25</td>
</tr>
<tr>
<td>Floor waste gully—without fixture</td>
<td>FW</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Glass-washing machine</td>
<td>GWM</td>
<td>40</td>
<td>3</td>
</tr>
<tr>
<td>Potato peeler</td>
<td>PP</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>Sanitary napkin disposal unit</td>
<td>SNDU</td>
<td>40</td>
<td>3</td>
</tr>
<tr>
<td>Shower—single</td>
<td>Shr</td>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 per shower head</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(continued)
### TABLE 6.1 (continued)

<table>
<thead>
<tr>
<th>Fixture</th>
<th>Fixture abbreviations</th>
<th>Min. size of trap outlet and fixture discharge pipe DN</th>
<th>Fixture unit rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sink—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>single (with or without disposal unit) (Note 4)</td>
<td>S</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>double (with or without disposal unit tea bar, domestic bar, commercial)</td>
<td>S</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>tea bar, domestic bar, commercial</td>
<td>TS</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Sink cleaner</td>
<td>CS</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Sink laboratory (Note 4)</td>
<td>LS</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Sink (pot or utility)</td>
<td>PS</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Slop hopper</td>
<td>SH</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Trough— ablution laundry (single or double)</td>
<td>Tr.(A)</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Urinal— wall-hung (including waterless), stall, or each 600 mm length of slab</td>
<td>Ur</td>
<td>40</td>
<td>32</td>
</tr>
<tr>
<td>Water closet pan</td>
<td>WC</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Water closet pan</td>
<td>WC</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Bathroom group in a single room (basin, bath, shower, water closet)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combination pan room sink and flushing bowl</td>
<td>PRS</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Combination pan room sink</td>
<td>PRS</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

1. The maximum discharge from any fixture into the single-stack and single-stack modified system is 500 L. If the discharge is in excess of 500 L, the fixture unit loading may be determined in accordance with Table 6.2.

2. Where a dishwashing machine is connected to a sink trap, only the sink fixture unit rating is considered. Where a clothes-washing machine is connected to a trough trap, only the trough fixture unit rating is considered.

3. Where waste fixtures are connected to a floor waste gully, the fixture unit rating of the floor waste gully is the sum of the fixture unit ratings of the fixtures connected.

4. To meet the requirements of AS 1428 (all parts), accessible design sinks on height adjustable working surfaces in kitchens and laboratories may have DN 40 fixture discharge pipes.

### TABLE 6.2

**FIXTURE UNIT RATINGS FOR CONTINUOUS FLOWS**

<table>
<thead>
<tr>
<th>Flow, L/s</th>
<th>0.5</th>
<th>1.0</th>
<th>1.5</th>
<th>2.0</th>
<th>2.5</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixture unit equivalent rating</td>
<td>6</td>
<td>8</td>
<td>15</td>
<td>25</td>
<td>40</td>
<td>60</td>
<td>85</td>
<td>115</td>
</tr>
</tbody>
</table>
6.4 TRAPPING OF FIXTURES AND APPLIANCES

6.4.1 General

Each sanitary fixture and appliance shall have a trap or self-sealing device. The trap or self-sealing device shall be in the same room as the fixture and/or appliance that it serves and be accessible.

6.4.2 Water seal

Under normal operating conditions, fixture traps shall retain a water seal of not less than 25 mm.

Traps that are installed in a pressurized chamber shall retain a water seal of not less than 70 mm when the maximum pressure within the chamber is applied.

6.4.3 Location of traps and self-sealing devices

Traps and self-sealing devices shall be connected as close as possible to the outlet of the fixture or appliance being served. The maximum distance from the outlet of a fixture to the surface of the water seal of a trap shall be 600 mm for other fixtures except for floor waste gullies (see Clause 4.6.7.7) and fixture pairs (see Clause 6.4.4.2).

6.4.4 Multiple outlets

6.4.4.1 General

The following fixtures, or a combination of them, may be connected in pairs to a single fixture trap provided the fixtures have similar spill levels:

(a) Basins.

(b) Sinks (other than pot, laboratory or utility sinks).

(c) Showers.

(d) Laundry troughs.

(e) Ablution troughs.

6.4.4.2 Distance between outlets

Pairs of fixtures shall be connected so that the distance between their outlets does not exceed 1.2 m (see Figure 6.1).

---

**FIGURE 6.1 TYPICAL INSTALLATION OF A FIXTURE PAIR**
6.5 GRADED DISCHARGE PIPES

6.5.1 Minimum grades

The minimum grades of discharge pipes shall comply with Table 6.3.

<table>
<thead>
<tr>
<th>Size of graded section of pipe DN</th>
<th>Minimum grade %</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>2.50</td>
</tr>
<tr>
<td>50</td>
<td>2.50</td>
</tr>
<tr>
<td>65</td>
<td>2.50</td>
</tr>
<tr>
<td>80</td>
<td>1.65</td>
</tr>
<tr>
<td>100</td>
<td>1.65</td>
</tr>
<tr>
<td>125</td>
<td>1.25</td>
</tr>
<tr>
<td>150</td>
<td>1.00</td>
</tr>
<tr>
<td>225</td>
<td>0.65</td>
</tr>
<tr>
<td>300</td>
<td>0.40</td>
</tr>
</tbody>
</table>

NOTE: Appendix B provides a table for conversion of grades as a percentage to grades as a ratio.

6.5.2 Connection methods

6.5.2.1 General

Connection of graded pipes to each other or connection of fixture discharge pipes to graded pipes shall comply with the following:

(a) Graded discharge pipes of different sizes shall be connected so that the soffits of both pipes are in common alignment.

(b) The invert level of a trap or floor waste gully weir shall be a minimum of 10 mm higher than the soffit of the graded discharge pipe to which it connects (see Figure 6.2).

![Diagram](FIGURE 6.2 TYPICAL CONNECTION OF FIXTURE DISCHARGE PIPE TO A COMMON DISCHARGE PIPE)

6.5.2.2 Opposed discharges

Opposed discharge pipes shall be connected to comply with Clause 6.5.2.1(b), using—

(a) two separate junction fittings; or

(b) junction branches fabricated so that the opposed junction entries do not overlap.
6.5.2.3 Junction types in graded pipes
Junctions (whether equal or unequal) shall be either 45° or sweep type.
Double 45° junctions or double sweep junctions shall not be used to make connections on grade.

6.5.2.4 Junctions installed at grade
Discharge pipes shall be joined at grade to each other by means of a 45° junction and shall comply with the following:
(a) Where a junction is used to make the connection of a branch drain to a main drain of the same size, the entry level of the branch drain may be on grade.
(b) Where unequal size junctions are used, the invert of the branch pipe shall be 10 mm higher than the soffit of the pipe to which it connects.

6.5.2.5 Junctions installed other than at grade
Pipes installed other than at grade shall be joined by means of a sweep or 45° junction provided, where a sweep junction is used, the invert of the branch pipe is at least 10 mm higher than the soffit of the main pipe.

6.5.2.6 Junctions installed in a vertical plane
Sweep and 45° junctions may be installed in the vertical plane for the connection of a single discharge pipe, provided only a 45° junction is used for the connection of a water closet pan.

6.5.2.7 Junctions for stacks connected to a graded pipe
Junctions installed on grade for the connection of a stack to a graded pipe shall be in accordance with Clause 6.7.3.

6.6 JUNCTIONS IN STACKS

6.6.1 Types
Any of the following types of junctions may be used to connect fixture, branch or common discharge pipes to a stack, the following apply:
(a) 45° junctions.
(b) Sweep junctions.
(c) Aerator junctions.
(d) Ball junctions.
(e) Square junctions.

No fixture shall be connected to the branch or common discharge pipe within 500 mm in length from the stack if the entry is at grade.

6.6.2 Restrictions for square and ball junctions
Where any fixture trap is connected to a ball junction, the weir of the fixture trap shall be at the same height or above the top of the branch junction fitting.

Where a square or ball junction is used and any discharge pipe is less than 500 mm in length from the stack, one of the following shall apply:
(a) A self-sealing device shall be fitted to the fixture.
(b) An S-trap shall be fitted to the fixture and a vertical dropper provided in the discharge pipe between the fixture and the stack junction.
A P-trap shall be fitted to the fixture, and the discharge pipe graded at not less than 6.65% (1 in 15).

6.6.3 ‘Text deleted’

6.6.4 ‘Text deleted’

6.6.5 Opposed connections

6.6.5.1 At the same level

Opposed connections at ball junctions or aerator junction fittings may be used only where the opposing pipes are connected to equal numbers of the same type of fixtures.

Opposed connections, other than at ball type junctions or aerator junction fittings, shall only be made using double 45° junctions or double sweep junctions.

6.6.5.2 At different levels

Graded fixture or common discharge pipes that are located at a lower level than any other opposed similar pipes shall not be connected to a stack within a restricted entry zone, as given in Table 6.4 and Figure 6.3, unless the lower pipe enters the stack at an angle of 45°.
Zone restrictions for stack connections:

(i) 45° junction
(ii) Sweep junction
(iii) Square junction
(iv) Double 45° junction or double sweep
(v) Opposed connection in restricted zone

(a) Zone restrictions for stack connections

(b) Connections in or near restricted zones

FIGURE 6.3 CONNECTIONS TO STACKS
### TABLE 6.4
RESTRICTED ENTRY ZONE REQUIREMENTS

<table>
<thead>
<tr>
<th>Discharge pipe size DN</th>
<th>Stack size DN</th>
<th>Restricted entry zone vertical depth, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;40 ≤65</td>
<td>&gt;40 ≤80</td>
<td>90</td>
</tr>
<tr>
<td>&gt;40 ≤65</td>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>&gt;40 ≤65</td>
<td>125</td>
<td>210</td>
</tr>
<tr>
<td>&gt;40 ≤65</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>≥80 ≤65</td>
<td>≥80</td>
<td>200</td>
</tr>
</tbody>
</table>

### 6.7 CONNECTIONS NEAR BASE OF STACKS

#### 6.7.1 Connections to drains or graded pipes

Discharge pipes shall connect to a drain or a graded pipe in accordance with Figure 6.4 and the following:

(a) For stacks of three floor levels or more—
   (i) no connection shall be made closer than 2.5 m downstream or 1 m upstream of the base of the stack; and
   (ii) no discharge pipe connecting a fixture upstream of a junction that connects a stack to a drain or graded pipe shall be closer than 1 m from the base of the stack.

(b) For stacks of two floor levels or less—
   (i) no connection shall be made closer than 500 mm downstream or upstream of the base of the stack; and
   (ii) no discharge pipe connecting a fixture upstream of a junction that connects a stack to a drain or graded pipe shall be within 500 mm of the base of the stack.

#### 6.7.2 Connections above base of stack (see Figure 6.4)

Branches shall not connect to a stack within the following distances measured vertically from the base of the stack to the invert of the branch:

(a) 600 mm for stacks that extend not more than five floor levels above the base of the stack.

(b) 1 m for stacks that extend more than five floor levels above the base of the stack.

(c) 2.5 m for all stacks in areas where foaming is likely to occur.
6.7.3 Connection of stacks to graded pipes or drains above ground

Connection of stacks to graded pipes or drains above the ground shall be made by—

(a) a 45° junction installed on grade and a bend at the base of the stack in accordance with Clause 6.7.4; or

(b) a 45° junction installed in the vertical plane with an extended branch so that the vertical projection of the stack, on the graded pipe or drain above the ground, is wholly outside the junction area, as shown in Figure 6.5.
6.7.4 Bends at the base of stacks

Bends at the base of stacks shall be not smaller in size than the graded pipe or drain to which they connect. They shall—

(a) have a centre-line radius not less than that stated in Table 6.5;

(b) consist of two 45° bends separated by a straight pipe of length not less than twice the bore of the pipe; or

(c) consist of an 88° bend where a stack extends through no more than two floor levels.

Where a stack is smaller than the graded pipe, a taper fitting shall be installed in the vertical stack, as shown in Figure 6.5.
TABLE 6.5
MINIMUM RADIUS FOR BENDS
AT THE BASE OF STACKS

<table>
<thead>
<tr>
<th>Pipe size DN</th>
<th>Radius (R) mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤100</td>
<td>225</td>
</tr>
<tr>
<td>&gt;100</td>
<td>300</td>
</tr>
</tbody>
</table>

6.8 VENTS

6.8.1 Prohibited use

Chimneys or ventilating shafts shall not be used for venting the sanitary plumbing and sanitary drainage system.

6.8.2 Minimum grade

Vents shall be installed at a minimum grade of 1.25% (1 in 80) so that any condensation or other liquids that form in or enter the vent will drain to the sanitary plumbing and sanitary drainage system.

6.8.3 Interconnections

Vents may only be interconnected above the flood level rim of the highest fixture or floor waste gully served by the vent.

The following vent pipes shall be vented to the open air independently and not be interconnected to any other system vent:

(a) Vent pipes from waste fixtures discharging into disconnector gullies.
(b) Chamber or steam relief vents from bedpan sanitizers and washers.
(c) Vent pipes from arrester chambers.
(d) Vent pipes from gullies located within buildings.

6.8.4 Termination

Vents shall terminate as shown in Figure 6.6 in the open air and in a location not less than—

(a) 600 mm above any opening into any building that is within a horizontal distance of 3 m from the vent;
(b) 150 mm above its point of penetration through any roof covering;
(c) 3 m above any trafficable roof deck that is within a horizontal distance of 3 m from the vent;
(d) 2 m above or 600 mm below any chimney or similar opening within a horizontal distance of 3 m from the vent;
(e) 5 m in any direction from any air duct intake; or
(f) 600 mm above any eaves, coping or parapet that is within a horizontal distance of 600 mm from the vent.
6.8.5 Connection to graded pipes

Where a vent is connected to a graded section of a discharge pipe, it shall be connected downstream of a fixture or trap and shall comply with Clause 7.5.1.1 (see Figure 6.7).

![Figure 6.6 Terminal of Vents](image1)

**Figure 6.6 TERMINATION OF VENTS**

**Figure 6.7 VENT CONNECTED TO GRADED PIPES**
6.9 AIR ADMITTANCE VALVES

6.9.1 Air admittance valves

Air admittance valves complying with AS/NZS 4936 may be used in sanitary plumbing systems for trap vents, group vents and stack vents and to ventilate branch drains. They shall not be used for the upstream venting of a main drain.

NOTE: Branches connected into a positive pressure area, such as near boundary traps in multistorey buildings, may need additional venting.

6.9.2 Requirements for use

The following apply:

(a) Air admittance valves shall be used only on systems that have at least one open upstream vent off the main drain. The upstream vent shall be sized in accordance with Table 3.5 and shall be not less than DN 50.

(b) Where the sanitary drains from three or more buildings on an allotment discharge to the sewerage system, the sanitary drainage system of each building shall have at least one open upstream vent connected to its sanitary drain.

(c) Air admittance valves shall have a determined airflow capacity not less than that in Table 6.6 when used as a trap vent, group vent or branch drain upstream vent, and Table 6.7 when used as a stack vent.

(d) An air admittance valve shall not be used as a stack vent where the stack extends through 10 or more floor levels.

(e) Where a sanitary plumbing system has a relief vent fitted to the stack, the relief vent shall be extended separately to atmosphere as an open vent.

(f) In Australia, air admittance valves that form an integral part of a fixture trap shall only be used as a trap vent.

### TABLE 6.6

<table>
<thead>
<tr>
<th>Minimum determined airflow capacity of AAV, L/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixture unit loading of discharge pipe</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>18</td>
</tr>
<tr>
<td>24</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>36</td>
</tr>
<tr>
<td>42</td>
</tr>
<tr>
<td>48</td>
</tr>
<tr>
<td>54</td>
</tr>
<tr>
<td>60</td>
</tr>
</tbody>
</table>

NOTE: Further values may be interpolated or extrapolated using the following equation, on which this Table is based:

For discharge pipes—

\[ Q = 2 \sqrt{(FU/6.75)} \]

where \( Q \) is the determined airflow capacity of the valve in litres per second, and \( FU \) is the fixture unit loading.
### TABLE 6.7
MINIMUM DETERMINED AIRFLOW CAPACITY OF AIR ADMITTANCE VALVES VENTING DISCHARGE STACKS

<table>
<thead>
<tr>
<th>Fixture unit loading of discharge stack</th>
<th>Minimum determined airflow capacity of AAV, L/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>30</td>
<td>16</td>
</tr>
<tr>
<td>40</td>
<td>18</td>
</tr>
<tr>
<td>60</td>
<td>23</td>
</tr>
<tr>
<td>80</td>
<td>26</td>
</tr>
<tr>
<td>100</td>
<td>29</td>
</tr>
<tr>
<td>200</td>
<td>41</td>
</tr>
<tr>
<td>300</td>
<td>51</td>
</tr>
<tr>
<td>400</td>
<td>58</td>
</tr>
<tr>
<td>500</td>
<td>65</td>
</tr>
<tr>
<td>600</td>
<td>72</td>
</tr>
<tr>
<td>1000</td>
<td>92</td>
</tr>
</tbody>
</table>

NOTE: Further values may be interpolated or extrapolated using the following equation, on which this Table is based:

For discharge stacks—

\[ Q = 8 \sqrt{\frac{FU}{6.75}} \]

where \( Q \) is the determined airflow capacity of the valve in litres per second, and \( FU \) is the fixture unit loading.

### 6.9.3 Location
Air admittance valves shall be—
(a) accessible for service, repair or replacement;
(b) located to allow adequate air to enter the valve;
(c) provided with ventilation openings when located in a wall space; and
(d) not installed where air is contaminated with solvents.

### 6.9.4 Installation
Air admittance valves shall be—
(a) connected to the piping in accordance with the manufacturer’s instructions;
(b) connected to a graded fixture or combined fixture/discharge pipe complying with Clause 7.5.1.1. Traps with integral air admittance valves do not need to comply with the limitations of at least 75 mm downstream of the trap nor the requirement of a 100 mm air cushion;
(c) installed upright within 5° of the vertical as shown in Figure 6.8;
(d) installed in areas where the ambient temperature or water discharge may vary between 0°C and 60°C;
(e) installed no more than 1000 mm below the flood level of the fixture to which it is connected;
(f) protected from insect entry;
(g) protected from ultra-violet rays if installed outdoors; and
(h) protected from mechanical damage.

NOTES:
1 Air admittance valves may be used as vacuum breaks on drains connected to vacuum sewerage systems.
2 Additional UV protection is not required where the UV protection is provided by the inherent properties of the materials of the valve body.

6.10 PRESSURE ATTENUATORS

6.10.1 General
Pressure attenuators may be used in sanitary plumbing systems as an alternative to relief venting. Attenuators are used to counter the tendency for the loss of trap water seals resulting from positive pressure pulses in discharge stacks. Positive pressure pulses or transients arise from disruptions to airflow produced at changes in direction or restriction to the airflow path.

The size of the pressure attenuator is independent of stack size and fixture unit loading.

Although the application of pressure attenuators is not limited by building height, this Standard covers installation of pressure attenuators in sanitary plumbing stacks up to 50 floor levels only.

6.10.2 Installation of pressure attenuators
Pressure attenuators shall be—
(a) connected to stacks by means of 45° or sweep junctions;
(b) positioned above the point of connection in either a vertical or horizontal orientation; and
(c) adequately supported with allowance for thermal movement.

Connections to the stack, other than those immediately above the base of the stack or offset, shall be above the branch discharge pipes at that floor level (see Figure 6.9).

6.10.3 Location
Pressure attenuators shall be accessible and installed in accordance with Table 6.8.

Where there is no stack offset, the connection for the lowest device shall be between the prohibited connection zone at the base of the stack (see Clause 6.7.2 and Figure 6.4) and the first branch connected to the stack (see Figure 6.10).

Where there is a stack offset, the connection for the lowest device above the offset shall be between the prohibited connection zone above the graded offset within the stack (see Clause 7.6.2.3 and Figure 7.12) and the first branch connected to the stack above that offset.

Where the stack extends through more than 25 floors (see Figure 6.10, 26–50 floors), two pressure attenuators, arranged in series, shall be used at the base of the stack.
<table>
<thead>
<tr>
<th>Number of floor levels served by the stack above base or offset</th>
<th>Location of pressure attenuators</th>
</tr>
</thead>
<tbody>
<tr>
<td>3–8</td>
<td>One at the base of the stack</td>
</tr>
<tr>
<td>9–15</td>
<td>One at the base of the stack, plus one at mid level of the stack</td>
</tr>
<tr>
<td>6–25</td>
<td>One at the base of the stack, plus one at intervals not exceeding 5 floor levels</td>
</tr>
<tr>
<td>26–50</td>
<td>Two at the base of the stack, plus one at intervals not exceeding 3 floors up to level 25, and at intervals not exceeding 5 floors above level 25</td>
</tr>
</tbody>
</table>
DIMENSIONS IN MILLIMETRES

FIGURE 6.8 FULLY VENTED MODIFIED SYSTEM USING AIR ADMITTANCE VALVES
FIGURE 6.9 TYPICAL CONNECTION OF PRESSURE ATTENUATORS TO STACKS
FIGURE 6.10 EXAMPLES OF TYPICAL PRESSURE ATTENUATOR INSTALLATIONS
SECTION 6A GREYWATER PLUMBING AND DRAINAGE SYSTEMS

6A.1 SCOPE OF SECTION

This Section specifies requirements for the installation of greywater sanitary plumbing and drainage from the respective plumbing fixtures to greywater treatment or diversion devices and overflow therefrom where directed to the drainage system.

Greywater systems may include the following:

(a) Direct diversion devices—
   (i) diversion valve installed in the sanitary plumbing system; or
   (ii) in-ground diversion vessels.

(b) Treatment systems.

Where a greywater treatment system is being used, the greywater shall be treated to an acceptable level as determined by the authority having jurisdiction.

NOTES:
1. The respective authority will determine the quality levels for treated greywater that is to be used for acceptable internal and external use.
2. Discharge from greywater treatment systems may be considered as a trade waste discharge and may require approval by the network utility operator for connection to the sewer system.

6A.2 GENERAL

Greywater plumbing and drainage systems shall be designed in such a manner so that—

(a) sewage surcharge cannot enter in-ground greywater diversion vessels or greywater treatment systems; and

(b) rainwater, stormwater and surface water cannot enter a network utility operator’s sewerage system or an on-site wastewater disposal system such as a septic tank or common effluent system.

Before commencing work on a greywater drainage system, approval shall be obtained from the authority/authorities having jurisdiction.

C6A.2 There are a number of authorities that should be consulted where greywater use is being considered. These authorities include the following:

(a) The network utility operator(s) responsible for drinking water supply and sewerage or both.

(b) The environmental protection authority.

(c) The respective health authority.

(d) Local councils.

Storage of untreated greywater for longer than 24 h is not recommended and may not be permitted under health requirements.

6A.3 MATERIAL AND PRODUCTS

All pipes and fittings from a sanitary fixture to a greywater diversion vessel shall comply with Section 2.
6A.4 INSTALLATION REQUIREMENTS

6A.4.1 Installation

Sanitary plumbing and drainage piping from a sanitary fixture to a greywater system shall comply with the following:

(a) In an area serviced by a network utility operator's wastewater system, a permanent connection to the wastewater system shall be maintained to enable the greywater to be redirected into the sanitary drain.

(b) Unless otherwise permitted by the regulatory authority, greywater to be returned to the network utility operator's wastewater system shall be conveyed via a disconnector gully.

(c) All access openings to any vessel shall be securely sealed and vermin-proofed.

(d) Greywater sanitary plumbing and drainage piping shall be installed directly to a treatment/diversion vessel and independently of other systems.

(e) Drainage from below-ground greywater diversion devices that gravitate to the sewer shall be protected from sewage surcharge by the installation of a reflux valve.

(f) All pipework greater than DN 80 connected to a diversion device or treatment system shall be clearly marked 'GREYWATER' at intervals not exceeding 1 m in accordance with AS 1345.

NOTE: A direct diversion device installed above the level of the overflow relief gully does not require protection from sewage surcharge.
SECTION 7 FULLY VENTED SYSTEMS AND FULLY VENTED MODIFIED SYSTEMS—DESIGN AND INSTALLATION

7.1 SCOPE OF SECTION
This Section specifies design requirements and methods of installation for fully vented systems and fully vented modified systems of sanitary plumbing.

7.2 SYSTEM TYPES
7.2.1 General
Systems installed in buildings may comprise either of the venting systems described in this Section or a combination of both systems.

7.2.2 Fully vented system
A fully vented system shall comprise a system of sanitary plumbing with provision for the individual venting of every fixture trap by means of a trap vent or air admittance valve (except for any traps permitted to discharge to a floor waste gully) and in which a relief vent is normally installed and is in accordance with the maximum fixture unit loadings in Tables 7.1 and 7.2.

7.2.3 Fully vented modified system
A fully vented modified system shall comprise a system of sanitary plumbing differing from the fully vented system in that each branch or discharge pipe connected to the stack is vented and some individual fixture trap vents or air admittance valves are omitted, and in which groups of two or more fixtures that discharge to the same graded pipe or branch are vented by means of one or more group vents or air admittance valves.

7.3 SIZE OF DISCHARGE PIPES
7.3.1 General
Discharge pipes shall be not less than the size of the fixture traps to which they are connected except in the case of water closet pans and slop hoppers, which may be connected to DN 80 discharge pipes.

7.3.2 Fixture unit loading
The size of any discharge pipe shall be determined from Table 7.1, taking into account—
(a) the sum of the fixture units that it carries (see Tables 6.1 and 6.2); and
(b) the proposed pipe grade.
TABLE 7.1

MAXIMUM FIXTURE UNIT LOADINGS FOR GRADED DISCHARGE PIPES

<table>
<thead>
<tr>
<th>Grade %</th>
<th>40</th>
<th>50</th>
<th>65</th>
<th>80</th>
<th>100</th>
<th>125</th>
<th>150</th>
<th>225</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.00</td>
<td>16</td>
<td>21</td>
<td>31</td>
<td>65</td>
<td>953</td>
<td>1959</td>
<td>7998</td>
<td></td>
</tr>
<tr>
<td>3.35</td>
<td>10</td>
<td>17</td>
<td>29</td>
<td>41</td>
<td>686</td>
<td>1445</td>
<td>5583</td>
<td></td>
</tr>
<tr>
<td>2.50</td>
<td>8</td>
<td>15</td>
<td>21</td>
<td>27</td>
<td>509</td>
<td>1148</td>
<td>4513</td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td>142</td>
<td>410</td>
<td>953</td>
<td>3739</td>
</tr>
<tr>
<td>1.65</td>
<td></td>
<td></td>
<td></td>
<td>16</td>
<td>115</td>
<td>342</td>
<td>813</td>
<td>3258</td>
</tr>
<tr>
<td>1.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>254</td>
<td>627</td>
<td>2656</td>
<td></td>
</tr>
<tr>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>509</td>
<td>2272</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1 Appendix B provides a table for conversion of grades as a percentage to grades as a ratio.
2 'x' indicates that the combination of pipe size and grade is not permitted.

7.3.3 Minimum size
The minimum size of any discharge pipe shall be DN 40.

7.3.4 Limitation on DN 80 pipes
Not more than two water closet pans shall be connected to a DN 80 discharge pipe.

7.3.5 Oversizing
Graded discharge pipes shall not be oversized for the sole purpose of acquiring a grade less than the minimum grades specified in Table 6.3.

7.4 SIZE OF STACKS
Stacks shall be sized in accordance with the following:

(a) The sum of the fixture unit ratings of all fixtures connected to any stack shall constitute the loading on the stack.

(b) Depending on the number of floor levels, the total loading on any stack shall not exceed the maximum given in Table 7.2(a) or Table 7.2(b).

(c) The total load increment from fixtures from any one floor level—
   (i) for stacks of four floor levels or more, shall not exceed 25% of the maximum stack capacity as specified in Table 7.2(a); and
   (ii) for stacks of three floor levels or less, shall not exceed 33% of the maximum stack capacity as given in Table 7.2(b).

(d) Such limitations as to the maximum fixture unit loading permitted to discharge into any stack within any one floor level, as specified in Item (c), shall also apply to connections to any section of a stack with a vertical length of 2.4 m into which one or more graded pipes, branches or stacks are connected (see Figure 7.1).

(e) Where the fixture unit loading at any one floor level exceeds the loading permitted in Table 7.2(a) or Table 7.2(b), the stack shall be increased in size.

(f) Where a DN 80 stack is installed as a fully vented modified system, the maximum number of water closet pans and slop hoppers connected to any graded pipe or branch shall not exceed two.

(g) Where any stack is offset, the offset section shall be sized—
   (i) as a straight stack, if the offset is more than 45° to the horizontal; or
(ii) as a graded pipe, if the offset is less than 45° to the horizontal, and the stack shall continue undiminished in size to above the highest connection.

Any reduction in stack size as given in Table 7.5 shall only be permitted above the highest connection.

**TABLE 7.2**

MAXIMUM LOADINGS ON STACKS IN FIXTURE UNITS

<table>
<thead>
<tr>
<th>Size of stack DN</th>
<th>Maximum loading per floor level</th>
<th>Maximum loading per stack</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(a) Four or more floor levels</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>50</td>
<td>9</td>
<td>36</td>
</tr>
<tr>
<td>65</td>
<td>14</td>
<td>56</td>
</tr>
<tr>
<td>80</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>100</td>
<td>125</td>
<td>500</td>
</tr>
<tr>
<td>125</td>
<td>250</td>
<td>1000</td>
</tr>
<tr>
<td>150</td>
<td>600</td>
<td>2400</td>
</tr>
<tr>
<td>225</td>
<td>1750</td>
<td>7000</td>
</tr>
<tr>
<td></td>
<td>(b) Three or fewer floor levels</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>50</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>65</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>80</td>
<td>13</td>
<td>40</td>
</tr>
<tr>
<td>100</td>
<td>65</td>
<td>195</td>
</tr>
<tr>
<td>125</td>
<td>150</td>
<td>450</td>
</tr>
<tr>
<td>150</td>
<td>250</td>
<td>750</td>
</tr>
<tr>
<td>225</td>
<td>950</td>
<td>2850</td>
</tr>
</tbody>
</table>

FIGURE 7.1 LIMITATIONS APPLYING TO BRANCH CONNECTIONS TO STACKS
7.5 VENTING

7.5.1 Trap vents

7.5.1.1 Connection for fixtures

Trap vents shall be connected to fixture discharge pipes in accordance with the following:

(a) In the case of basins and bidets, the vent shall be connected no closer than 75 mm and no further than 600 mm from the crown of the fixture trap, provided no change of direction occurs between the trap and the vent connection (see Figure 7.2).

(b) In the case of fixtures other than basins and bidets, the vent shall be connected between 75 mm and 1500 mm from the crown weir of the fixture trap, provided that, where the S-trap is fitted or a bend is fitted downstream of the P-trap, the vent connection on the vertical discharge pipe is at least 300 mm from any bend at the base of the vertical section.

DIMENSIONS IN MILLIMETRES

FIGURE 7.2 TRAP VENTS

7.5.1.2 Topmost fixture connected to the stack

Where the topmost discharge pipe connection to the stack exceeds 6 m for combination pan rooms sinks (DN 100), slop hoppers (DN 100), water closet pans and 2.5 m for all other fixtures, a trap vent shall be connected in accordance with the requirement of Clauses 7.5.1.1(a) and (b).

7.5.1.3 Size

The minimum size of trap vents shall be as specified in Table 7.3.
TABLE 7.3
MINIMUM SIZE OF TRAP VENTS

<table>
<thead>
<tr>
<th>Size of fixture trap DN</th>
<th>Size of trap vent DN</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>32</td>
</tr>
<tr>
<td>≥50 ≥100</td>
<td>40</td>
</tr>
</tbody>
</table>

7.5.1.4 Installation

Every trap vent shall be extended upwards to a point above the flood level rim of the fixture in accordance with one of the following (see Figure 7.3):

(a) As a vertical vent to open air.
(b) On an ascending grade of at least 1.25%, as a vertical vent to the open air.
(c) On an ascending grade of at least 1.25% to a connection with a vertical or branch vent.
(d) Looped downwards, either vertically or on a descending grade of at least 1.25% to a connection at lower level with a vertical or branch vent.

7.5.1.5 Common vent for fixtures

A single vent pipe may be used to ventilate the traps of any two fixtures connected in common to a vertical discharge pipe provided that (see Figure 7.4)—

(a) P-traps are used;
(b) where the discharge pipes from both fixtures are connected at the same level, either a Y-junction with a 90° included angle or a junction with opposed sweep entries is used;
(c) the vent pipe is sized for the larger trap; and
(d) the distance from the weir of either trap to the vent connections complies with Clause 7.5.1.1.
FIGURE 7.3 TYPICAL INSTALLATION OF TRAP VENTS
7.5.2 Branch vents

7.5.2.1 Size

The size of any branch vent shall be in accordance with Table 7.4.
7.5.2.2 **Arrangement**

Branch vents are used to interconnect two or more trap vents or group vents. Branch vents shall be installed in accordance with the following:

(a) Branch vents may interconnect with relief vents or stack vents, or extend separately upwards to the open air.

(b) The point of connection between any branch vent and any other vent shall be above the flood level rim of the highest fixture connected to the common graded pipe or branch served by the branch vent.

7.5.2.3 **Size changes**

Where the branch discharge pipe varies in size along its length, the corresponding sections of a branch vent shall be sized separately in accordance with Table 7.4. Any enlargement in size in the branch vent shall occur prior to the junction with the trap vent or group vent (see Figure 7.5).

**TABLE 7.4**

<table>
<thead>
<tr>
<th>Size of branch discharge pipe (DN)</th>
<th>Size of branch discharge pipe (DN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>32</td>
</tr>
<tr>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>65</td>
<td>40</td>
</tr>
<tr>
<td>80</td>
<td>50</td>
</tr>
<tr>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>150</td>
<td>80</td>
</tr>
</tbody>
</table>

![FIGURE 7.5 SIZING OF BRANCH VENTS](COPYRIGHT)
7.5.3 Relief vents

7.5.3.1 General

A1 If one or more floors separate the floor levels of the highest and lowest branch pipe connected to the stack (see Figure 7.6), a relief vent shall be installed in accordance with Clauses 7.5.3.2 to 7.5.3.5, or pressure attenuators may be installed as specified in Clause 6.10.

![Diagram of Typical Relief Vent Installation](image)

FIGURE 7.6 TYPICAL RELIEF VENT INSTALLATION

7.5.3.2 At offsets in stacks

Where any stack is offset at less than 45° to the horizontal, a relief vent shall be provided—

(a) on the stack below the offset if, disregarding the offset, one or more floors separate the floor levels of the highest and lowest branch pipe connected to the stack; and

(b) on the stack above the offset, if one or more floors separate the floor levels of the highest and lowest branch pipe connected to the section of the stack above the offset (see Figure 7.7).

The lower relief vent may interconnect with the upper relief vent above the flood level rim of the lowest fixture served by the upper relief vent.
7.5.3.3 Connection

Relief vents shall be connected to stacks, below the lowest connection, at an angle of 45° (see Figure 7.6).

7.5.3.4 Upper termination

Relief vents shall either—

(a) extend upwards at a minimum grade of 1.25% and interconnect with a stack vent, a header vent or another relief vent; or

(b) extend upwards to the open air and terminate in accordance with Clause 6.8.4.

7.5.3.5 Size

The size of any relief vent shall be in accordance with Table 7.5, having regard to the size of the stack, the sum of the rating of all fixtures connected and the developed length of the vent measured along the pipework from its lowest connection to the stack to its upper termination point.

A relief vent need not be larger than the stack to which it is connected.
7.5.4 Stack vents

7.5.4.1 Extension

The stack vent may extend separately to atmosphere or interconnect with the relief vent above the overflow level of the highest fixture connected to the stack, and shall be sized in accordance with Table 7.5, except that the stack vent need not be larger than the stack.

### TABLE 7.5

SIZE OF RELIEF VENTS AND STACK VENTS

<table>
<thead>
<tr>
<th>Size of stack fixture units connected</th>
<th>Required vent size, DN</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN</td>
<td>32</td>
</tr>
<tr>
<td>40</td>
<td>16</td>
</tr>
<tr>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>50</td>
<td>36</td>
</tr>
<tr>
<td>65</td>
<td>20</td>
</tr>
<tr>
<td>65</td>
<td>56</td>
</tr>
<tr>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>100</td>
<td>300</td>
</tr>
<tr>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td>125</td>
<td>300</td>
</tr>
<tr>
<td>125</td>
<td>750</td>
</tr>
<tr>
<td>125</td>
<td>1100</td>
</tr>
<tr>
<td>150</td>
<td>700</td>
</tr>
<tr>
<td>150</td>
<td>1300</td>
</tr>
<tr>
<td>150</td>
<td>2400</td>
</tr>
<tr>
<td>225</td>
<td>1700</td>
</tr>
<tr>
<td>225</td>
<td>4000</td>
</tr>
<tr>
<td>225</td>
<td>7000</td>
</tr>
</tbody>
</table>

7.5.4.2 Developed length

The developed length of the stack vent shall be—

(a) for stacks with relief vents, the length of the relief vent; or

(b) for stacks without relief vents, the length of stack vent and stack to the point of connection of the lowest branch.

7.5.5 Cross-relief vents

Cross-relief vents shall be installed in accordance with the following:

(a) Vertical sections of stacks, 20 floor levels or more in height, measured between the highest graded pipe or branch connected and the point of connection of any relief vent shall be cross-relief vented to the relief vent at intervals of not more than 16 floor levels.

(b) The size of the cross-relief vent shall be the size of the main relief vent or the size of the stack, whichever is the smaller.

(c) Cross-relief vents shall connect into the stack at an angle of 45°.

(d) Cross-relief vents shall commence from below the lowest branch connection to the stack from the floor level concerned and join into the main relief vent above the flood level rim of the lowest fixture, discharging into the stack at that floor (see Figure 7.8).
(c) In the case of a stack with a steep offset, such stack shall be deemed to be straight with only one vertical section.

FIGURE 7.8 TYPICAL INSTALLATION OF CROSS-RELIEF VENTS

7.5.6 Header vents

7.5.6.1 General

Stack vents may be connected at their uppermost end into a common header vent (see Figure 7.9) terminating at one point.
7.5.6.2 Sizing

Header vents shall be sized in accordance with the following procedure:

(a) Determine from Table 7.6 the number of DN 50 vents that are equivalent to individual stack vents or relief vents intercepted at lower level by the header vent.

(b) Add together all such numbers.

(c) Note from Table 7.6 the size of single equivalent header vent.

(d) Where a stack has a relief vent, take into account the size of the relief vent only, in the determination of the equivalent number of DN 50 vents.

(e) Where any change in size is to be made on the graded header vent, increase the size downstream of, and adjacent to, the vent junction.

NOTE: Header vents need not be greater than DN 300.
### Table 7.6

#### Size of Header Vents

<table>
<thead>
<tr>
<th>Size of stack vent or relief vent DN</th>
<th>Equivalent number of DN 50 vents</th>
<th>Size of header vent DN</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>65</td>
<td>2</td>
<td>65</td>
</tr>
<tr>
<td>80</td>
<td>3</td>
<td>80</td>
</tr>
<tr>
<td>100</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>125</td>
<td>11</td>
<td>125</td>
</tr>
<tr>
<td>150</td>
<td>18</td>
<td>150</td>
</tr>
<tr>
<td>250</td>
<td>72</td>
<td>250</td>
</tr>
<tr>
<td>300</td>
<td>117</td>
<td>300</td>
</tr>
</tbody>
</table>

### 7.5.7 Group and common vents

#### 7.5.7.1 General

One group vent shall be provided for each 10 fixtures, or part thereof, in any group connected to a common discharge pipe.

In order to determine which group of fixtures shall be group-vented, each fixture discharge pipe that is individually connected to the common discharge pipe shall be counted progressively from the fixture discharge pipe nearest the stack. Any vented fixture discharge pipe that is connected to the common discharge pipe shall not be included in such a method of counting.

#### 7.5.7.2 Arrangement

Group vents shall be installed in accordance with the following:

(a) The first group vent, for all types of fixtures, shall connect to the discharge pipe of the most upstream fixture or floor waste gully at a maximum distance of 1.5 m from the fixture trap.

(b) The second group vent, and any additional group vents, shall be spaced along the common discharge pipe to divide the fixtures into approximately equal groups and each shall branch either from a fixture discharge pipe, increased in size where necessary to the size of the group vent, or from the top of the common discharge pipe.

(c) Where any vertical drop occurs in a common discharge pipe and fixtures are connected to the lower section, a group vent shall be provided—

   (i) from the top of the vertical drop (see Clause 7.5.7.5.2);

   (ii) between the vertical drop and the first downstream fixture; or

   (iii) from the first downstream fixture discharge pipe.

The common vent pipe from any two fixtures installed in accordance with Clause 7.5.1.5 may also serve as a group vent.

#### 7.5.7.3 Sizing

The size of group vents shall be determined by the size of the common discharge pipe in accordance with Table 7.7.

Where a common discharge pipe varies in size along its length, the group vent shall be sized in relation to the largest section of the common discharge pipe.
TABLE 7.7
SIZE GROUP VENTS

<table>
<thead>
<tr>
<th>Size of common discharge pipe DN</th>
<th>Size of single group vent DN</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>32</td>
</tr>
<tr>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>65</td>
<td>40</td>
</tr>
<tr>
<td>80</td>
<td>50</td>
</tr>
<tr>
<td>100</td>
<td>56</td>
</tr>
</tbody>
</table>

7.5.7.4 Termination

Group vents shall terminate in the same manner as branch vents (see Clause 7.5.2.2) or with an air admittance valve (AAV) in accordance with Clause 6.9.

7.5.7.5 Group-vented branches (see Figure 7.10)

7.5.7.5.1 Size

Group-vented branches shall be sized in accordance with Clause 7.5.7.3 except that if the group vent is larger than the discharge pipe to which it connects, the discharge pipe shall be increased to the size of the group vent.

7.5.7.5.2 Arrangement

Where practicable, group-vented branches shall be installed on a grade. A maximum vertical drop of 1.5 m is permitted.

7.5.7.5.3 Connection of common discharge pipe

The common discharge pipe of any group-vented branch shall connect—

(a) directly to a stack;
(b) to a junction with another common discharge pipe; or
(c) in the case of ground floor fixtures—
   (i) direct to drain; or
   (ii) to a disconnector gully.

7.5.7.5.4 Connection of basins and bidets

When connected to a group-vented branch, each basin and bidet shall have a DN 40 trap and fixture discharge pipe not greater than 2.5 m in length with a maximum vertical drop of 1.5 m (see Figure 7.11). The maximum number of bends in a fixture discharge pipe shall be in accordance with Clause 8.5.4.
Connections of one common discharge pipe with another (see Clause 7.5.7.3(b))

Group vent branching from common discharge pipe

Group vent branching from fixture discharge pipe

Common vent from fixtures (see Clause 7.5.7.2)

Alternative positions of second group vent (see Clause 7.5.7.2(b))

Drop 1500 max.

Group vent downstream of vertical drop (see Clause 7.5.7.2(c))

Drop 1500 max.
(see Clause 7.5.7.5.2)

Connection to relief vent
(see Clause 7.5.2.2)

Vent pipe to open air
(see Clause 6.6.3(a))

Group vent

Connection to disconnector gully
(see Clause 7.5.7.5.3(c)(ii))

Ground floor connections direct to drain
(see Clause 7.5.7.5.3(c)(iii))

Vertical discharge pipe

DIMENSIONS IN MILLIMETRES

FIGURE 7.10 TYPICAL FULLY VENTED MODIFIED SYSTEM SHOWING GROUP VENTS

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7.5.7.5.5 Connection of all other fixtures

Fixtures other than basins and bidets shall—

(a) be connected separately to the group-vented branch except as provided in Clause 7.5.7.2;

(b) have a length of any DN 100 fixture discharge pipe not greater than 6 m;

(c) have a length of any fixture discharge pipe smaller than DN 100 not greater than 2.5 m;

(d) have a maximum vertical interval between the crown of the trap and the top of the group vented branch of 2.5 m;

(e) have the maximum number of bends in a fixture discharge pipe comply with Clause 8.5.4; and

(f) have a reducer fitting installed where a water closet pan with a DN 100 outlet connects to a graded pipe or branch of DN 80.

7.6 OFFSETS IN STACKS

7.6.1 Steep offsets

7.6.1.1 General

A steep offset is any offset made at an angle of more than 45° to the horizontal.

7.6.1.2 Sizing of stack

The size of the steep offset stack shall be in accordance with Clause 7.4(g) and the maximum fixture unit loading shall comply with Table 7.2.

7.6.1.3 Venting

Venting for the steep offset stack shall be in accordance with the following:
(a) Where a relief vent is installed below the lowest connection to the stack as specified in Clause 7.5.3.1, additional relief vents in close proximity to the bends of the offset are not required.

(b) Cross-relief vents shall be installed in accordance with Clause 7.5.5.

(c) Stack vents shall be installed in accordance with Clause 7.5.4.

7.6.2 Graded offsets

7.6.2.1 General

A graded offset is any offset made at an angle of less than 45° to the horizontal.

7.6.2.2 Minimum grade

The minimum grade of a graded offset shall be in accordance with Table 7.8.

<table>
<thead>
<tr>
<th>Size of grade section DN</th>
<th>Min. gradient %</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤80</td>
<td>2.50</td>
</tr>
<tr>
<td>100</td>
<td>1.65</td>
</tr>
<tr>
<td>125</td>
<td>1.25</td>
</tr>
<tr>
<td>150</td>
<td>1.25</td>
</tr>
<tr>
<td>225</td>
<td>0.60</td>
</tr>
<tr>
<td>300</td>
<td>0.40</td>
</tr>
</tbody>
</table>

7.6.2.3 Restricted connection zones above the graded offset (see Figure 7.12)

For graded offsets, no connection shall be made within—

(a) 600 mm of the bend, when the stack extends not more than five floor levels above the offset;

(b) 1 m of the bend when the stack extends more than five floor levels above the offset; or

(c) 2.5 m, when foaming is likely to occur.
7.6.2.4 Restricted connection zone below the graded offset
No connection shall be made within 600 mm of the bend.

7.6.2.5 Restricted connection zone within the graded offset (see Figure 7.13)
No connection shall be made within—
(a) 2.5 m of the upper bend; or
(b) 450 mm of the lower bend.
7.6.2.6 Sizing of stack

The size of the graded offset stack shall be in accordance with Clause 7.4(g) and the maximum fixture unit loading on the graded section shall comply with Table 7.1.

7.6.2.7 Venting

Positive air pressure pulses in a stack with a graded offset shall be controlled by either one of the following methods:

(a) By venting in accordance with the following:

(i) Relief vents to be installed in accordance with the relevant sections of Clause 7.5.3 (see Figure 7.6 or Figure 7.7).

(ii) Cross-relief vents to be installed in accordance with Clause 7.5.5.

(iii) Stack vents to be installed in accordance with Clause 7.5.4.

(b) By the use of pressure attenuators in accordance with Clause 6.10.
SECTION 8 SINGLE STACK SYSTEMS AND SINGLE STACK MODIFIED SYSTEMS—DESIGN AND INSTALLATION

8.1 SCOPE OF SECTION
This Section specifies design and installation requirements for single stack systems and the single stack modified systems of sanitary plumbing.

8.2 SYSTEM DESIGN
8.2.1 General
Single stack systems are designed on the principle that the stack is not to be less than DN 100; however, variations to these requirements are permitted in this Standard.

8.2.2 Single stack systems (see Figure 8.1)
Single stack systems are also designed on the principle that the air within the discharge pipes from fixtures, the stack and the stack vent allow the permitted type and number of fixtures (see Clause 8.4) to be connected to the stack without the need for individual trap vents or, in the case of ranges of fixtures (see Clause 8.5.10), venting of the common discharge pipe.

In domestic or residential buildings, fixtures shall be connected to the stack individually or through floor waste gullies.

In commercial or industrial buildings, fixtures may be connected to the stack individually, through floor waste gullies or in ranges of the same type of fixtures.

The maximum number of floor levels through which the stack passes shall be as specified in Clause 8.2.5.

8.2.3 Single stack modified system (see Figure 8.2)
The single stack modified system permits stacks to receive a higher discharge loading or to be extended to serve a greater number of floor levels by introducing a relief vent and cross-vents, or by the use of pressure attenuators. Where cross-vents are used, they shall be installed between the relief vent and stack. Where pressure attenuators are used, they shall be installed in accordance with Clause 6.10.

The single stack modified system allows these increases in loading or height without increasing the nominal size of the stack.

The maximum number of floor levels through which the stack passes shall be as specified in Clause 8.2.5.
FIGURE 8.1 (in part)  SINGLE STACK SYSTEMS

(a) Domestic or residential building
(see Table 8.3)
FIGURE 8.1 (in part) SINGLE STACK SYSTEMS

(b) Commercial or industrial building
(see Table 8.4)
LEGEND:

B = basin
Bth = bath
FW = floor waste
Shr = shower
Tr = trough
W.C. = water closet

(a) Domestic or residential building
(see Table 8.5)

FIGURE 8.2 (in part) SINGLE STACK MODIFIED SYSTEMS
8.2.4 Design requirements

When sizing stacks, consideration shall be given to—

(a) the load-production effect of fixtures connected to the stack;
(b) the maximum number of floor levels permitted to be connected to the stack;
(c) the class of building served; and
(d) whether relief vents and cross-vents are installed.

8.2.5 Number of floor levels (see Figure 8.3)

The maximum number of floor levels through which the stack passes, as permitted in Tables 8.3, 8.4, 8.5 and 8.6, shall be counted from the point at which the stack connects to the drain or graded pipe and the highest floor level on which a fixture is connected. Where the distance between the invert of the drain or graded pipe and the lowest floor level exceeds 2.4 m, that floor shall be counted as an additional floor level.
8.3 RATING OF FIXTURES

The fixture unit ratings set out in Table 6.1 shall apply to fixtures connected in accordance with this Section.

Where the discharge from plant room equipment is connected to any single stack system, the loading in fixture units shall be determined in accordance with Table 6.2.
8.4 FIXTURES PERMITTED TO BE CONNECTED

8.4.1 Domestic or residential buildings

The type and total number of fixtures that are permitted to be connected to a single stack from any floor level in a residential building shall not exceed the following (see Table 8.3):

(a) Two basins.
(b) Two baths.
(c) Two bidets.
(d) Two clothes-washing machines.
(e) Two dishwashing machines.
(f) Two kitchen sinks (double or single domestic with or without food waste disposal units).
(g) Two laundry troughs.
(h) Two showers.
(i) Two water closet pans.
(j) Two floor waste gullies.
(k) Two bar sinks.

8.4.2 Commercial or industrial buildings

The type and total number of fixtures that are permitted to be connected to a single stack from any floor level in a commercial building by fixture discharge pipes, common discharge pipes or ranges of fixtures shall not exceed the following (see Table 8.4):

(a) For separate pipes—
   (i) five basins;
   (ii) one cleaner’s sink;
   (iii) one drinking fountain;
   (iv) one sink;
   (v) five urinals (wall-hung);
   (vi) five water closet pans;
   (vii) two showers;
   (viii) one 3 m slab type urinal; or
   (ix) two bar sinks.

No additional or alternative fixtures shall be connected except tundishes receiving minor discharges.

At any floor level, the maximum discharge from all floor waste gullies shall not exceed five basins, one drinking fountain, one cleaner’s sink and two showers (see Note 3 to Table 6.1).

(b) For ranges of fixtures—
   (i) five basins;
   (ii) five urinals (wall-hung); and
   (iii) five water closet pans.
8.5 CONNECTION OF FIXTURES WITHOUT TRAP VENTS

8.5.1 Separate fixture discharge pipes

Each fixture shall be connected to the stack by a separate unvented fixture discharge pipe of
a prescribed length, size and grade in accordance with Table 8.2, except as provided in
Clause 8.5.2. Where the length of the discharge pipe exceeds that allowed in Table 8.2, a
trap vent shall be provided in accordance with Clause 7.5.1.

8.5.2 Permitted variations

The following variations are permissible:

(a) Stacks, either straight or with offsets as specified in Clause 7.6, that receive only the
discharge from waste fixtures shall have unvented fixture discharge pipes installed in
accordance with Table 8.2.

(b) Stacks without offsets shall be sized having a maximum fixture unit loading in
accordance with Table 8.1.

(c) The requirements of Clause 8.4, whether the stack is straight or with an offset, as
regards the maximum number and type of waste fixtures permitted to be connected to
the stack from any floor level need not apply.

(d) Not more than one-quarter of the maximum loading as shown in Table 8.1 shall
discharge into the stack at any one floor level except where the stack is DN 50 or
smaller, or as permitted in Clauses 8.8.8 and 8.8.9.

(e) Fixture discharge pipes jointed together close to the stack may be installed in
accordance with Clause 8.5.6.

(f) Fixture discharge pipes connected to a stack by means of a short vertical pipe shall
connect to the stack in accordance with Clause 8.5.7 and Figure 6.3(b).

(g) In the case of stacks of size between DN 65 and DN 100 only, two fixtures of the
same type (fixture pairs) may jointly discharge to the common fixture trap and fixture
discharge pipe complying with Clause 6.4.4.

(h) In the case of stacks of size between DN 100 and DN 150 only, fixtures of the same
type (ranges of fixtures in commercial-type buildings) that separately discharge to a
common discharge pipe shall be in accordance with Clause 8.5.10.

| TABLE 8.1 |
| SIZE OF WASTE STACK |
| Size of stack DN | Maximum fixture unit loading |
| 40 | 2 |
| 50 | 6 |
| 65 | 15 |
| 80 | 30 |
| 100 | 120 |

8.5.3 Opposed junctions

The size and location of junctions between discharge pipes and the discharge stack designed
to prevent cross-flow and water seal siphonage shall comply with Clause 6.6.5.

8.5.4 Bends in fixture discharge pipes

The number of bends in a fixture discharge pipe shall comply with the following:

(a) Other than the discharge pipes from basins and bidets, not more than two bends in the
horizontal plane and three bends in the vertical plane shall be allowed.
(b) Each basin and bidet shall have not more than two bends in the horizontal plane and two bends in the vertical plane.

(c) For the purpose of this Clause, a bend of 45° or less shall not be considered as a change in direction or grade.

**TABLE 8.2**

FIXTURE DISCHARGE PIPES WITHOUT TRAP VENTS TO STACKS

<table>
<thead>
<tr>
<th>Fixture DN</th>
<th>Maximum length m</th>
<th>Permitted grade %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste fixtures</td>
<td>2.5</td>
<td>2.50 to 5.00</td>
</tr>
<tr>
<td>Water closet pans 100</td>
<td>6.0</td>
<td>1.65 to 5.00</td>
</tr>
<tr>
<td>80</td>
<td>2.5</td>
<td>1.65 to 5.00</td>
</tr>
<tr>
<td>Urinals 50-80</td>
<td>2.5</td>
<td>2.50 to 5.00</td>
</tr>
<tr>
<td>100</td>
<td>6.0</td>
<td>1.65 to 5.00</td>
</tr>
</tbody>
</table>

NOTE: See Table 6.1 for the sizes of fixture discharge pipes.

8.5.5 *Vertical dropper on fixture discharge pipes*

The maximum length of a vertical dropper on any fixture discharge pipe shall be 2.5 m except for basins and bidets, where it shall be 1.5 m.

8.5.6 *Connection from waste fixtures to stack*

Two fixture discharge pipes, including discharge pipes from floor waste gullies, receiving the discharge from waste fixtures, may connect to the stack within a distance of 1 m by means of a 45° junction, provided (see Figure 8.4)—

(a) the angle between the two fixture discharge pipes is not greater than 45°;

(b) the outlet of the junction is one size larger than the largest fixture pipe except in the case of a floor waste gully that does not receive the discharge from a fixture; and

(c) the section of pipe downstream of the 45° junction is included as part of the permitted maximum length of the fixture discharge pipe.

![Figure 8.4 Unequal Stack Junction](COPYRIGHT)
8.5.7 Connection from waste fixtures to stack below restricted zone

Fixture discharge pipes, including those from floor waste gullies, may be connected immediately below the restricted zone vertical depth by means of a short vertical drop adjacent to the stack (see Table 6.4 and Figure 6.3(b)).

8.5.8 Floor waste gullies

Floor waste gullies shall be installed in accordance with Clause 4.6.7.

8.5.9 Traps

Traps shall be installed in accordance with Clause 6.4.

8.5.10 Connection of ranges of fixtures

A range of fixtures of the same type in commercial buildings may discharge through a common discharge pipe without venting. The junction at the point of connection between a fixture discharge pipe and the common discharge pipe shall be a 45° or sweep junction.

8.5.11 Ranges of basins

8.5.11.1 General

The maximum number of basins shall be five (see Figure 8.5).

---

![Diagram of basins and traps](https://via.placeholder.com/150)

(a) Range of unvented pluggable basins

(b) S-trap

(c) P-trap

FIGURE 8.5 CONNECTION OF BASINS
8.5.11.2 Fixture discharge pipe
The fixture discharge pipe from each basin to the point of connection to the common discharge pipe shall be—
(a) of size DN 40;
(b) not longer than 1 m;
(c) installed with not more than one bend; and
(d) graded within the range of 2.5% to 5%.

8.5.11.3 Common discharge pipe
The common discharge pipe shall be—
(a) not smaller than DN 50;
(b) not longer than 4.5 m;
(c) installed without a bend; and
(d) graded within the range of 2.5% to 5%.

8.5.11.4 Spacing of traps
The distance between the centre-lines of adjacent traps and between the near face of the stack and the centre-line of the nearest trap shall not exceed 2 m.

8.5.12 Ranges of water closet pans
8.5.12.1 General
The maximum number of water closet pans shall be five (see Figure 8.6).

![Diagram of connection of water closet pans]

**FIGURE 8.6 CONNECTION OF WATER CLOSET PANS**
8.5.12.2 *Fixture discharge pipe*

The fixture discharge pipe from each water closet pan to the point of connection to the common discharge pipe shall be—

(a) not longer than 1.5 m for S-trap pans and 2 m for P-trap pans;
(b) installed with a maximum of two bends; and
(c) graded within the range of 1.65% to 5%.

8.5.12.3 *Common discharge pipes*

The common discharge pipe shall be—

(a) not smaller than DN 100;
(b) not longer than 10 m;
(c) installed with not more than two bends; and
(d) graded within the range of 1.65% to 5%.

8.5.12.4 *Spacing of traps*

The distance between the centre-lines of adjacent traps and the near face of the stack and the centre-line of the nearest connected trap shall not exceed 6 m.

8.5.13 *Ranges of wall-hung urinals*

8.5.13.1 *General*

The maximum number of wall-hung urinals shall be five (see Figure 8.7).

![Connection of Wall-Hung Urinals](image)

**FIGURE 8.7 CONNECTION OF WALL-HUNG URINALS**

8.5.13.2 *Fixture discharge pipe*

The discharge pipe from each urinal to the point of connection to the common discharge pipe shall be—

(a) DN 50;
(b) not longer than 1 m;
(c) installed with not more than one bend; and
(d) graded within the range of 2.5% to 5%.
8.5.13.3 Common discharge pipe

The common discharge pipe shall be—

(a) not smaller than DN 65;
(b) not longer than 10 m;
(c) installed with not more than two bends; and
(d) graded within the range of 2.5% to 5%.

8.5.13.4 Spacing of traps

The distance between the centre-lines of adjacent traps and the near face of the stack and the centre-line of the nearest connected trap shall not exceed 2.5 m.

8.6 VENTING OF STACKS

8.6.1 General

The stack shall continue upwards to the vent cowl undiminished in size. Stacks that extend not more than three floor levels with a maximum loading of 30 fixture units may have the vent reduced to DN 50.

8.6.2 Cross-vents (single stack modified system)

8.6.2.1 General

Cross-vents shall interconnect the stack with the relief vent. Cross-vents shall be installed commencing on the lowest floor level served and then from other floors as given in Table 8.5 or Table 8.6 as applicable, except that a cross vent need not be fitted above the highest fixture connected to the stack.

8.6.2.2 Installation

Cross-vents shall be installed in accordance with the following:

(a) The cross-vent shall connect to the stack at a height of not less than 50 mm or more than 600 mm above the flood level rim of the highest fixture connected to the stack at the floor concerned. The connection between the cross-vent and stack shall be at an angle of entry of 45°, and the cross-vent shall be extended upwards at 45° to the point of connection with the relief vent.

(b) The cross vent may be omitted in lieu of a vent connecting to the highest graded pipe that receives the discharge from a water closet pan at the floor concerned, at a point that is as close to the stack as is practicable. The vent shall be connected to the soffit of the graded pipe, and shall be extended upwards to a height of not less than 50 mm above the flood level rim of the water closet pan served, before interconnecting with the relief vent.

(c) Where there is no water closet pan connected at the floor concerned, the vent shall connect into the highest graded pipe on that floor, provided that the graded pipe is not less than DN 80 at the point of connection to the vent.

(d) Cross-vents shall be constructed from materials authorized for use in sanitary plumbing systems. Changes of direction and junctions or connections shall be made using methods as detailed in this Standard.

8.6.3 Relief vents (single stack modified system)

Relief vents shall be installed in accordance with Clause 7.5.3.
8.7 SIZING OF STACKS

8.7.1 Single stack systems

Stacks shall be sized using the individual fixture unit ratings as given in Table 6.1, and shall be as given in Table 8.3 or Table 8.4, as appropriate.

TABLE 8.3
SINGLE STACK SYSTEMS—DOMESTIC OR RESIDENTIAL BUILDINGS (see Figure 8.1(a))

<table>
<thead>
<tr>
<th>Size of stack DN</th>
<th>Maximum fixture unit loading</th>
<th>Maximum number of consecutive floor levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>260</td>
<td>10</td>
</tr>
<tr>
<td>125</td>
<td>390</td>
<td>15</td>
</tr>
<tr>
<td>150</td>
<td>780</td>
<td>30</td>
</tr>
</tbody>
</table>

TABLE 8.4
SINGLE STACK SYSTEMS—COMMERCIAL OR INDUSTRIAL BUILDINGS (see Figure 8.1(b))

<table>
<thead>
<tr>
<th>Size of stack DN</th>
<th>Maximum fixture unit loading</th>
<th>Maximum number of consecutive floor levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>60</td>
<td>4</td>
</tr>
<tr>
<td>125</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>150</td>
<td>200</td>
<td>8</td>
</tr>
</tbody>
</table>

8.7.2 Single stack modified systems

Stacks shall be sized using the individual fixture unit ratings as specified in Table 6.1, and shall be as given in Table 8.5 or Table 8.6, as appropriate.

TABLE 8.5
SINGLE STACK MODIFIED SYSTEMS—DOMESTIC OR RESIDENTIAL BUILDINGS (see Figure 8.2(a))

<table>
<thead>
<tr>
<th>Size of stack DN</th>
<th>Maximum fixture unit loading</th>
<th>Maximum number of consecutive floor levels</th>
<th>Size of relief vent and cross vent DN</th>
<th>Location of Cross-vents</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>290</td>
<td>up to 15</td>
<td>50</td>
<td>Alternate floors</td>
</tr>
<tr>
<td>100</td>
<td>390</td>
<td>up to 15</td>
<td>50</td>
<td>Each floor</td>
</tr>
<tr>
<td>100</td>
<td>320</td>
<td>16 to 20</td>
<td>65</td>
<td>Alternate floors</td>
</tr>
<tr>
<td>100</td>
<td>500</td>
<td>16 to 20</td>
<td>65</td>
<td>Each floor</td>
</tr>
</tbody>
</table>

TABLE 8.6
SINGLE STACK MODIFIED SYSTEMS—OTHER THAN RESIDENTIAL TYPE BUILDINGS (see Figure 8.2(b))

<table>
<thead>
<tr>
<th>Size of stack DN</th>
<th>Maximum fixture unit loading</th>
<th>Maximum number of consecutive floor levels</th>
<th>Size of relief vent and cross vent</th>
<th>Location of Cross-vents</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>120</td>
<td>5 to 12</td>
<td>50</td>
<td>Each floor</td>
</tr>
<tr>
<td>125</td>
<td>250</td>
<td>13 to 18</td>
<td>65</td>
<td>Each floor</td>
</tr>
<tr>
<td>150</td>
<td>600</td>
<td>19 to 24</td>
<td>80</td>
<td>Each floor</td>
</tr>
</tbody>
</table>
8.8 VARIATIONS TO SINGLE STACK SYSTEMS

8.8.1 General

The following variations to the requirements of this Section may be used:

NOTE: The variations are actual installations that have been subjected to performance testing:

(a) A DN 80 stack up to three floors in height for domestic or residential buildings may have variations as detailed in Clause 8.8.2.

(b) A DN 80 stack up to two floors in height with top section graded (nominally horizontal) may have variations as detailed in Clause 8.8.3.

(c) A DN 100 stack up to three floors in height with top section graded (nominally horizontal), receiving a maximum discharge of 30 fixture units, may have variations as detailed in Clause 8.8.4.

(d) A DN 100 stack of one floor in height with top section graded (nominally horizontal), receiving a maximum discharge of 90 fixture units, may have variations as detailed in Clause 8.8.5.

(e) Connection of multiple fixtures located on the floor above a graded offset to a common branch pipe, which connects into or below the offset in a stack of not less than DN 100, may be made in accordance with Clause 8.8.6.

(f) A waste stack up to DN 100, with graded offset between the highest and lowest connections, may have variations as detailed in Clause 8.8.7.

(g) A DN 65 waste stack up to two floors in height, receiving the discharge from kitchen sinks and laundry troughs, may have variations as detailed in Clause 8.8.8.

(h) Connection of waste fixtures to DN 50 stack vent in DN 80 and DN 100 stacks may be made in accordance with Clause 8.8.9.

(i) Trap vent required on fixtures, connected at the change of direction in a DN 80 or DN 100 stack with top section nominally horizontal, is to be installed in accordance with Clause 8.8.10.

(j) A steep offset may be used as detailed in Clause 8.9.1(a).

(k) A graded offset may be used as detailed in Clause 8.9.1(b).

In areas where foaming is likely to occur, the minimum distance permitted at or near the offsets may need to be increased.

8.8.2 DN 80 stack

A stack of DN 80, serving not more than three floor levels in domestic or residential buildings, may receive discharge pipes provided that the installation complies with the following:

(a) The stack shall not exceed three floor levels in height measured between the base of the stack and the highest floor level upon which a fixture is connected to the stack.

(b) The stack loading shall not exceed 30 fixture units.

(c) No more than one fixture of each of the following types listed is to discharge into the stack at each floor level:

(i) Basin.
(ii) Bath.
(iii) Dishwashing machine.
(iv) Kitchen sink.
(v) Shower.
(vi) 'Text deleted'

(d) No laundry trough or clothes-washing machine shall be connected to the stack.

(e) Each fixture shall discharge into the stack by means of an individual fixture discharge pipe.

(f) The stack shall be straight between the discharge pipe of the highest fixture connected and the drain, and have no offset or other deviation from the vertical.

(g) The graded section of the drain to which the base of the stack connects shall be no smaller than DN 100.

(h) Offsets shall only be permitted in the stack vent above the highest branch connection to the stack. The offsets shall preferably be greater than 45° (steep offsets).

NOTE: Offsets less than 45° are permitted.

8.8.3 DN 80 stack with the top section graded and installed in a domestic or residential building

A stack of DN 80, serving not more than two floor levels with the top section graded nominally horizontal, may receive the discharge from fixtures without vents on the fixture discharge pipes, provided that the installation complies with the following (see Figure 8.8):

(a) Fixtures shall discharge to the graded section by means of an individual fixture discharge pipe.

(b) Not more than one of each of the following fixtures shall discharge to the graded section:
   (i) Bath.
   (ii) Basin.
   (iii) Dishwashing machines.
   (iv) Kitchen sink.
   (v) Shower.

   (vi) 'Text deleted'

(c) No laundry trough or clothes-washing machine shall be connected to the stack.

(d) No fixtures shall be connected to the lower vertical section of the stack.

(e) The connection of a fixture discharge pipe to the graded section of a stack shall be not less than 450 mm from the lower vertical section of the stack measured from the inlet of the lower bend commencing the graded section.

The graded section of the stack may be reduced in size along its length towards the vent, according to the size of individual fixture discharge pipes connected to it. In no case shall the graded section or vent be smaller than DN 50.
8.8.4 DN 100 stack up to three floors with the top section graded and installed in a domestic or residential building receiving 30 fixture units

A stack of DN 100, serving not more than three floor levels with the top section graded nominally horizontal in a domestic or residential building, may receive the discharge from fixtures without vents on the fixture discharge pipes, provided the installation complies with the following (see Figure 8.9):

(a) Fixtures shall discharge to the graded section by means of individual fixture discharge pipes.

(b) The stack shall not exceed three floor levels in height and the stack loading shall not exceed 30 fixture units.

(c) The connection of a fixture discharge pipe to the graded section of the stack shall be not less than 450 mm from the lower vertical section of the stack, measured from the inlet of the lower bend commencing the graded section.

The graded section of the stack may be reduced in size along its length towards the vent according to the size of the individual fixture discharge pipe connected to it. In no case shall the graded section or vent be smaller than DN 50.
8.8.5 DN 100 stack of one floor with top section graded

A stack of DN 100 serving the first floor above ground level in a domestic or residential building may receive the discharge from fixtures without vents on the fixture discharge pipes provided the installation complies with the following (see Figure 8.10):

(a) Fixtures shall discharge to the graded section by means of individual fixture discharge pipes (see Table 8.2).

(b) The stack loading shall not exceed 90 fixture units.

(c) The connection of a fixture discharge pipe to the graded section of the stack shall be not less than 450 mm from the lower vertical section of the stack measured from the inlet of the lower bend commencing the graded section.

(d) Branches shall not be connected to the vertical sections of the stack within 600 mm below the lower bend forming part of the offset. The graded section of the stack may be reduced in size along its length towards the vent, according to the size of individual fixture discharge pipes connected to it. In no case shall the graded section or vent be smaller than DN 50.
8.8.6 Connection for multiple fixtures into or below a graded offset (DN 100 stacks) (see Figure 8.11)

Multiple fixtures located on the floor above a graded offset may be connected by means of a common discharge pipe into or below the graded section of the offset in accordance with Clause 7.6.2, provided that the stack to which the branch pipe connects does not exceed—

(a) five floors above the graded offset with a maximum loading of 90 fixture units; or
(b) three floors above the graded offset with a maximum loading of 45 fixture units.
8.8.7 Waste stack up to DN 100 with either graded or steep offset between the highest and lowest connections

8.8.7.1 Graded offsets

A waste stack up to DN 100 may have graded offsets installed between the highest and lowest graded pipes provided the following requirements are met (see Figure 8.12):

(a) The maximum fixture unit loading permitted to discharge through the graded section of the offset shall be as given in Table 8.7.

<table>
<thead>
<tr>
<th>Size of graded section of offset DN</th>
<th>Maximum fixture unit loading permitted through the offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>65</td>
<td>8</td>
</tr>
<tr>
<td>80</td>
<td>24</td>
</tr>
<tr>
<td>100</td>
<td>60</td>
</tr>
</tbody>
</table>

(b) The distance between the centre-lines of the vertical sections of a stack each side of the graded offset shall be not less than 1 m.

(c) For stacks DN 80 or smaller, no branch shall connect to the stack within 900 mm above the upper offset bend. However, DN 80 stack with offset may have the minimum vertical distance of 900 mm reduced to 600 mm provided that the height between the highest connection to the stack and the upper offset bend does not exceed three floor levels.

(d) For DN 100 stacks only, the connection near the upper offset bend shall be in accordance with Table 8.8.
TABLE 8.8
OFFSET REQUIREMENTS FOR DN 100 WASTE STACKS

<table>
<thead>
<tr>
<th>Max. height in consecutive floor levels above upper offset bend</th>
<th>Min. distance between upper offset bend and connection of fixture and discharge pipe, mm</th>
<th>Max. fixture unit loading (see Table 8.10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>450</td>
<td>60</td>
</tr>
<tr>
<td>10</td>
<td>600</td>
<td>60</td>
</tr>
</tbody>
</table>

(e) Where connections are made to the stack below the offset, the size of the offset and the stack above the offset and up to the vent cowl shall be as determined from Table 8.7. The fixture unit loading for the complete stack shall be determined from Table 8.1. The stack size shall be the greater value, determined from Tables 8.1 and 8.7.

(f) Branches shall not connect to the vertical sections of the stack within 600 mm below the lower bend forming part of the offset.

(g) Where no connections are made to the stack below the offset, the maximum fixture unit loading permitted to discharge through the offset shall be as given in Table 8.1 for the upper vertical section and the offset shall be increased to the next larger size.

(h) The connection of multiple fixtures into the offset shall be in accordance with Clause 8.8.6.

(i) Where unvented fixtures are connected into the graded section, the fixture discharge pipe shall comply with Table 8.2.

(j) Where a common discharge pipe is connected into the stack, and a relief vent and cross-vents are installed, the fixture loading permitted to discharge to the stack shall be as given in Table 7.2.
8.8.7.2 Steep offsets

A waste stack of up to DN 100 may have steep offsets between the highest and lowest graded pipes connected, provided the following requirements are met:

(a) Where the fixtures are unvented in accordance with Item (g), the maximum fixture unit loading permitted to discharge to the stack shall not exceed 120 fixture units.

(b) Steep offsets of 60° or more to the horizontal shall have no connections made above the offset within—
   (i) 450 mm of the upper bend, when the stack extends through five floors or less above the offset; or
   (ii) 600 mm of the upper bend, when the stack extends through more than five floors above the offset.

(c) Steep offsets of less than 60° to the horizontal shall have no connections made above the offset within 150 mm of the upper bend for stacks of any height.

(d) Steep offsets of less than 60° to the horizontal shall have no connections made into the offset within—
   (i) 2.5 m of the upper bend; or
   (ii) 450 mm of the lower bend.

(e) Steep offsets of 60° or more to the horizontal shall have no restrictions within the offset, provided that any such connection is made using a 45° or sweep junction.

(f) Steep offsets shall have no connections made below the offset within 600 mm of the lower bend.
(g) Where unvented single waste fixture discharge pipes are connected into the stack, the maximum length shall be in accordance with Table 8.2.

(h) Where a common discharge pipe is connected into the stack and a relief vent is installed, the fixture unit loading permitted to discharge to the stack shall be in accordance with Table 7.2.

8.8.8 DN 65 waste stack

A waste stack of DN 65 may receive the discharge from kitchen sinks and laundry troughs provided—

(a) the stack does not exceed two floor levels in height measured between the base of the stack and the highest floor level upon which a fixture is connected; and

(b) not more than two kitchen sinks, or one kitchen sink and one laundry trough, are separately connected at each floor level.

8.8.9 DN 50 vertical section of stack

Three waste fixtures only basins, showers or kitchen sinks may be connected to the top DN 50 vertical section of a stack not more than three floor levels in height with a maximum loading of 30 fixture units (see Figure 8.13).

![Diagram of DN 50 vertical section of stack](image)

> FIGURE 8.13 TYPICAL CONNECTION OF WASTE FIXTURES TO A DN 50 VERTICAL SECTION OF STACK

8.8.10 Connection at the change of direction in stack with top section graded

Where a DN 80 or DN 100 stack has the top section nominally horizontal, a trap vent or air admittance valve shall be required on a fixture discharge pipe that connects to the stack at the point at which the top graded section joins the vertical section of the stack (see Figure 8.14).
8.9 OFFSETS IN SINGLE STACK SYSTEMS ONLY

8.9.1 General

Offsets may be used in single stack design. An offset may be either—

(a) a steep offset made at an angle of more than 45° to the horizontal; or

(b) a graded offset made at an angle of less than 45° to the horizontal, the minimum grade which shall be 2.5% for waste stacks of DN 80 or smaller and 1.65% for stacks of DN 100 or larger.

8.9.2 Steep offsets

DN 100 stacks may be offset between the base of the stack and the highest connection (see Figure 8.15) in accordance with the following:

(a) The height of the stack shall not exceed 10 consecutive floor levels.

(b) Laundry troughs shall only be connected to the stack as specified in Clause 8.9.3, except as provided in Clause 8.9.4.

(c) Connections near the upper and lower offset bends and the maximum fixture unit loading to the stack shall be in accordance with Table 8.9, except as provided in Clause 8.9.4.

(d) The minimum distance between the connection of any fixture discharge pipe and the upper offset bend shall be no less than 100 mm (see Figure 8.16).
**TABLE 8.9**  
OFFSET REQUIREMENTS

<table>
<thead>
<tr>
<th>Maximum height in consecutive floor levels above upper offset bend</th>
<th>Minimum distance between upper offset bend and connection of fixture discharge pipe, mm</th>
<th>Minimum distance between lower offset bend and connection of fixture discharge pipe, mm</th>
<th>Maximum fixture unit loading (see Table 8.10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>450</td>
<td>600</td>
<td>90</td>
</tr>
<tr>
<td>10</td>
<td>600</td>
<td>600</td>
<td>150</td>
</tr>
<tr>
<td>10</td>
<td>900</td>
<td>600</td>
<td>260</td>
</tr>
</tbody>
</table>

**FIGURE 8.15 TYPICAL STEEP OFFSET**

Stack DN 100 min.

4th

3rd

Minimum distance (see Table 8.9)

2nd

600 mm min.

1st

Ground

To sewer
**8.9.3 Connection of laundry troughs to DN 100 stacks**

Laundry troughs may be connected into either the upper or lower vertical section of a steep offset stack.

Laundry troughs shall only be connected to the upper section of a DN 100 stack in accordance with Table 8.10.

**TABLE 8.10**

<table>
<thead>
<tr>
<th>Maximum height in consecutive floor levels above upper offset bend</th>
<th>Minimum distance between upper offset bend and connection of fixture discharge pipe, mm</th>
<th>Maximum fixture unit loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>450</td>
<td>50</td>
</tr>
<tr>
<td>10</td>
<td>600</td>
<td>50</td>
</tr>
</tbody>
</table>

**8.9.4 Steep offsets below the lowest connection**

Where a steep offset is installed below the lowest connection to a stack of not less than DN 100, the minimum distance between the fixture connection and the upper offset bend shall be in accordance with Table 8.9. This distance may be reduced to 100 mm provided the following requirements are met (see Figure 8.17):

(a) The number of consecutive floor levels above the upper offset bend served by fixtures shall be three or less.

(b) The maximum loading shall not exceed 30 fixture units through the offset section.

(c) A laundry trough shall not be connected.
8.9.5 Graded offsets

DN 100 stacks may be offset between the base of the stack and the highest connection (see Figure 8.18) provided with the following requirements are met:

(a) Only one graded offset shall be permitted in any stack.
(b) The height of the stack shall not exceed 10 consecutive floor levels.
(c) The minimum distance between the centre-lines of the vertical sections of the stack shall be 2 m.

The fixtures may be connected either into—

(i) the upper vertical section in accordance with Clause 7.6.2; or
(ii) the graded or lower vertical section in accordance with Clause 7.6.2.
8.9.6 Connections above the offset

Where fixtures are connected into the upper vertical section, the following apply:

(a) The height of the vertical section of the stack above the upper offset bend shall not exceed five consecutive floor levels.

(b) The maximum loading shall not exceed 90 fixture units.

(c) No connection shall be made to the vertical section within 900 mm of the upper offset bend.

Where a water closet pan is the lowest fixture connected, the distance may be reduced to 600 mm, provided the fixture discharge pipe from the water closet pan is fitted with a DN 40 trap vent (see Figure 8.18).
SECTION 9 GENERAL INSTALLATION OF PIPEWORK

9.1 SCOPE OF SECTION
This Section specifies requirements for the fixing, protection, spacing, and concealment of sanitary plumbing pipes and fittings.

9.2 SUPPORT AND FIXING OF PIPEWORK

9.2.1 Brackets, clips and hangers
Brackets, clips and hangers shall be installed at the spacings given in Table 9.1 and shall be—

(a) formed of a suitable material;
(b) securely attached to the building structure and not to any other service;
(c) designed to withstand the applied loads;
(d) protected against corrosion where exposed to a corrosive environment;
(e) made from compatible materials;
(f) clamped securely to prevent movement, unless designed to allow for thermal movement;
(g) restrained to restrict lateral movement; and
(h) designed so that pipes and fittings are supported with minimal load being taken by the joints.

<table>
<thead>
<tr>
<th>Pipework material</th>
<th>Maximum spacing of supports, m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vertical pipes</td>
</tr>
<tr>
<td>Cast iron</td>
<td>3</td>
</tr>
<tr>
<td>Ductile iron</td>
<td>3</td>
</tr>
<tr>
<td>Copper, copper alloy</td>
<td>3</td>
</tr>
<tr>
<td>FRC</td>
<td>4</td>
</tr>
<tr>
<td>PVC-U DN 40-50</td>
<td>2</td>
</tr>
<tr>
<td>PVC-U DN 65</td>
<td>2.5</td>
</tr>
<tr>
<td>PP</td>
<td>2</td>
</tr>
<tr>
<td>PE</td>
<td>2</td>
</tr>
</tbody>
</table>

NOTE: For all pipe materials maximum spacings shall be in accordance with manufacturer’s recommendations.

9.2.2 Prohibited supports
The method of supporting or spacing of pipes by means of brazing or welding a short section of any material to the surface of each pipe shall not be permitted.
9.2.3 Holes in framework
Where holes are formed in the framework to accommodate pipework, they shall be sized to allow free longitudinal movement of the pipework without affecting the structural integrity of the framework.

9.3 LOCATION
Pipework shall be located—
(a) so that it does not interfere with the normal operation of any door, window, access opening or with any other aspects of the normal operation of a building;
(b) where it does not cause a nuisance or injury to persons;
(c) not directly above drinking water storage tanks;
(d) as close as practicable to the wall of any building or supporting structure;
(e) so that it is adequately protected from mechanical damage;
(f) with clearance from other services in accordance with Clause 3.6.1; and
(g) when constructed of plastic—
   (i) at a minimum distance of 75 mm from an insulated heated water pipe or 150 mm from an uninsulated heated water pipe; and
   (ii) below a heated water pipe at a minimum distance of 150 mm from a insulated heated water pipe or 300 mm from an uninsulated heated water pipe.

9.4 CONCEALMENT OF PIPES AND FITTINGS
9.4.1 General
Pipes and fittings installed in buildings may be concealed provided inspection openings are accessible.

9.4.2 Extension of inspection openings
Inspection openings may be extended to a wall or slab surface, to facilitate ease of maintenance.

9.4.3 Structural concrete or brickwork
Piping shall not be installed in any structural concrete slab, beam, column, concrete wall or load-bearing brickwork, unless approved by a professional engineer.

9.4.4 Dry wall construction
Pipework concealed in dry wall construction shall not structurally interfere with the wall.

9.4.5 Multiple dwellings
Any discharge pipes that only serve fixtures within one dwelling in a domestic or residential building shall be located wholly within that dwelling.

9.4.6 Walk-in pipe ducts
Pipework concealed in walk-in pipe ducts shall be installed so that there is clear and adequate space remaining to facilitate access for any inspection.
9.5 TESTING AND INSPECTION OPENINGS

9.5.1 General requirements
This Clause applies to plumbing systems, including elevated pipework, using drainage principles.

NOTE: For sanitary drains, see Clause 4.7.

9.5.2 Location of testing and inspection openings
All common discharge pipes and stacks shall be provided with openings for inspection and testing in the following locations:

(a) In any common discharge pipe where necessary for inspection and testing.
(b) At the base of every stack.
(c) At any level of a stack where necessary for inspection and testing.
(d) At intervals of no greater than 30 m in every common discharge pipe.
(e) At every junction fitting that connects a common discharge pipe to a stack, or in the upstream section of the common discharge pipe.

NOTES:
1. Inspection and testing openings may be raised to finished surface level and fitted with an airtight removable cap.
2. Where testing or inspection openings are located within a tenancy occupied by another party, consideration should be given to raising the inspection or testing opening into the tenancy that it serves.

9.5.3 Size of testing and inspection of openings
Testing and inspection openings shall have a minimum clear diameter in accordance with Table 9.1A.

<table>
<thead>
<tr>
<th>Nominal size DN</th>
<th>Minimum clear diameter mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>24</td>
</tr>
<tr>
<td>50</td>
<td>29</td>
</tr>
<tr>
<td>65</td>
<td>60</td>
</tr>
<tr>
<td>80</td>
<td>75</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>175</td>
<td>150</td>
</tr>
<tr>
<td>225</td>
<td>150</td>
</tr>
<tr>
<td>300</td>
<td>150</td>
</tr>
</tbody>
</table>

9.5.4 Access to inspection openings
Every required inspection opening shall be accessible.

9.6 INSTALLATION OF COPPER AND COPPER ALLOY PIPES

9.6.1 General
Copper and copper alloy pipes shall be installed in accordance with AS 4809 and the Clauses 9.6.2 to 9.6.4.
9.6.2 Fixing

Copper and copper alloy pipes shall be fixed in accordance with the following:

(a) All brackets other than at expansion joints shall, when fully tightened, permit longitudinal movement of the tubing.

(b) All brackets for use at expansion joints shall, when tightened evenly, securely clamp the expansion joint fitting and prevent movement.

(c) All brackets shall be lined with PVC or other authorized non-abrasive and inert material, for the part of the fastener that is in contact with the pipe.

9.6.3 Expansion joints

9.6.3.1 General

Expansion joints shall be provided for all copper and copper alloy pipes used for sanitary plumbing systems in accordance with Clauses 9.6.3.2, 9.6.3.3 and 9.6.3.4, as appropriate.

9.6.3.2 Stacks

Stacks shall be provided with expansion joints in accordance with the following:

(a) Where any stack extends through more than two floors whether above its base or above any offset bend, expansion joints shall be fixed—

(i) at the base of the stack or in the vertical pipe above an offset bend; and

(ii) at each alternate floor level when the stack is unrestrained in accordance with Clause 9.6.4, or at each floor level except the top floor when the stack is restrained or subject to heated water discharges such as those from dishwashing machines.

(b) The expansion joint at any intermediate floor shall be placed immediately above the junction of the highest discharge pipe connected at the floor concerned.

9.6.3.3 Graded discharge pipes

Where graded discharge pipes are restrained and are more than 6 m in length, an expansion joint shall be installed in the graded pipe as close as practicable to the stack.

9.6.3.4 Bedpan sanitizer and washer

Where a bedpan sanitizer and washer is supplied with steam and connected to a soil stack, soil vent or steam relief vent, an expansion joint shall be installed at each floor in the soil stack, soil vent and steam relief vent pipe.

9.6.4 Freedom from restraint

A copper or copper alloy pipe is considered to be unrestrained (see Figure 9.1), provided the following requirements are met:

(a) Where the pipe passes through walls or floors there shall be no restraint on longitudinal movement. An annular space of at least 6 mm shall be provided, and such space may be filled with an authorized flexible material.

(b) There shall be no restraint on movement on any branch discharge pipe for a distance of 450 mm from its junction with a stack. Where the discharge pipe traverses any floor or wall within such a distance, an annular space of at least 6 mm shall be provided, which may also be filled with an authorized flexible material.

9.7 INSTALLATION OF PVC-U PIPES

PVC-U pipes shall be installed in accordance with AS/NZS 2032 or NZS 7643, as appropriate, and the requirements of this Standard.
9.8 INSTALLATION OF HIGH DENSITY POLYETHYLENE (PE-HD) PIPES
PE-HD piping systems shall be installed in accordance with AS 2033, the manufacturer’s instructions, and the following:

(a) When passing through concrete footings, PE-HD pipes and fittings shall be wrapped with an impermeable flexible sheath of not less than 6 mm thick or as specified by a professional engineer.

(b) When fully encased in concrete structures, subject to the approval of a professional engineer, PE-HD pipes and fittings shall be installed in accordance with the manufacturer’s installation instructions (see Clause 9.4.3).

9.9 INSTALLATION OF FRC PIPES
FRC pipes shall be installed in accordance with the manufacturers’ installation instructions and the requirements of this Standard.

9.10 DISCONNECTION OF SANITARY PLUMBING
Disused pipework shall be disconnected as near as practicable to the connecting pipe remaining in service, and the remaining fitting made watertight by using a cap or plug sealed in a manner appropriate for the material remaining in use.

9.11 IDENTIFICATION OF PIPES
Other than in houses or duplexes, all pipes installed in ducts, accessible ceilings or exposed in basements or plant rooms shall be clearly identified in accordance with AS 1345 or NZS 5807, as appropriate.
AS/NZS 3500.2:2003

Hot discharge

Cold discharge

Expansion joint not required at top floor unless restrained at point of roof penetration

Roof

Clear space 6 min.

5th

Expansion joints

4th

Expansion joint above offset band

3rd

Expansion joints

2nd

Expansion joint

1st

Expansion joint at base of stack

Ground floor

Ground level

(a) Location of expansion joints

(b) Freedom from restraint

NOTE: Vents omitted for clarity.

DIMENSIONS IN MILLIMETRES

FIGURE 9.1 EXPANSION JOINTS IN COPPER AND COPPER-ALLOY STACKS
9.12 INSTALLATION OF ABOVE-GROUND (ELEVATED) PIPEWORK AND CONNECTION OF FIXTURES USING DRAINAGE PRINCIPLES

9.12.1 General
Above-ground (elevated) pipework and associated fixture connections may be installed within buildings provided they are installed in accordance with the requirements of Clauses 9.12.2 to 9.12.4.

9.12.2 Maximum length and size
The maximum length and size of any unvented graded pipe, branch or fixture discharge pipe shall be in accordance with Clause 3.10 and Table 3.6.

9.12.3 Permitted installations
The requirements of this Section shall apply to the first four floor levels only above either the invert level of the connection point to the boundary trap riser or inspection shaft, and the uppermost floor only where connected into a discharge stack. Branches serving the uppermost floor, which connect to a discharge stack, are permitted to use drainage principles. Branches serving the floors below the uppermost floor shall comply with a nominated stack design in accordance with Clause 9.12.4(b).

9.12.4 Installation
Above-ground (elevated) pipework, materials, methods of support and fixing shall be in accordance with the relevant requirements of this Standard (see Figure 9.2) and the following:

(a) No graded discharge pipe or branch, except a discharge stack, shall connect to any vertical section of pipework within the first four floor levels.

(b) Any discharge stack system in excess of the maximum of four floor levels specified in Clause 9.12.3 shall be installed as a stack in accordance with the relevant requirements of Section 6, Section 7, Section 8 or Section 9, as applicable.

(c) The loading in fixture units shall not exceed the maximum permitted as specified in Tables 3.1, 3.6 and 7.2, as applicable.

(d) The connection of any discharge pipe or branch to the elevated pipework shall be in accordance with the relevant requirements of Clauses 6.6, 6.7, 7.6 and 8.9, and Section 9A.

(e) The total length of an unvented branch pipe, including the length of the fixture discharge pipe that connects to the main section of graded elevated pipework, shall be in accordance with Clause 3.10.3.

NOTES:
1 The discharge stack may roll over on the top floor or carry on as a stack vent.
2 A maximum loading of 30 fixture units, including not more than two WC pans or two slop hoppers, are permitted to discharge into any branch on the top floor of a discharge stack without further ventilation.
9.13 INSTALLATION OF BOUNDARY TRAPS, REFUX VALVES AND GULLIES ABOVE GROUND WITHIN BUILDINGS

9.13.1 Boundary traps

Boundary traps installed within a building and above ground or floor surface level shall comply with the relevant requirements of Clause 4.4.

9.13.2 Reflux valves

Reflux valves within a building shall be installed in accordance with the following:
9.13.3 Gullies

Gullies located within buildings shall—

(a) be installed above ground or floor surface level;
(b) be supported in the same manner as for a boundary trap;
(c) be provided with an overflow pipe that shall terminate at a height in accordance with Clause 4.6.6; and
(d) comply with the relevant requirements of Clause 4.6.

9.14 METHODS OF JOINTING OF PIPES

9.14.1 General

The joints between discharge pipes, vent pipes, fittings, fixtures and appliances shall be made as appropriate for the materials being joined, and each joint shall be rendered airtight.

Joints between similar and dissimilar materials shall be made using one of the joint types given in Table 9.2.

Jointing materials shall comply with Clause 2.6.
TABLE 9.2
PERMISSIBLE JOINTS FOR PIPES AND FITTINGS
OF SIMILAR AND DISSIMILAR MATERIALS

<table>
<thead>
<tr>
<th>To—Material 2</th>
<th>Cast and ductile iron</th>
<th>Copper and copper alloy</th>
<th>Galvanized steel</th>
<th>From—Material 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast and ductile iron</td>
<td>BG RR ER</td>
<td>BG RR* SB/ER</td>
<td>BG RR* ER</td>
<td>BG RR</td>
</tr>
<tr>
<td>Galvanized steel</td>
<td>BG RR* ER</td>
<td>BG SB/TH SB/ER</td>
<td>TH BG</td>
<td>TH</td>
</tr>
<tr>
<td>PP</td>
<td>BG RR</td>
<td>SB/TH RR</td>
<td>TH</td>
<td>RR TH EF</td>
</tr>
<tr>
<td>PE</td>
<td>BG RR</td>
<td>SB/TH RR</td>
<td>TH</td>
<td>RR TH SC/TH RR BC</td>
</tr>
</tbody>
</table>

* Applies to vent connections only.

LEGEND:
BG = bolted gland  
RR = rubber ring  
ER = epoxy resin  
CM = cement mortar  
SB = silver brazed  
SC = solvent cement  
TH = threaded  
BC = band clamped sleeve  
EF = electrofusion

NOTE: Where more than one joint type is shown separated by one or more slashes, the joint between the two different materials requires an adaptor. The order of the joints is always shown from (Material 1) to (Material 2) as indicated in the Table headings.
9.14.2 Bolted gland joints (BG)

Bolted gland joints shall comply with AS 1631 for cast iron material and, for other materials, with the relevant requirements of AS 1631.

The sealing rings used shall be appropriate for the material and dimensions of the pipes or fittings being joined.

9.14.3 Rubber ring joints (RR)

When used in sanitary drainage work, rubber ring joints used below ground shall be designed to inhibit root penetration.

9.14.4 Epoxy resin joints (ER)

Epoxy resin shall be appropriate to the materials being joined and shall be mixed and applied in strict accordance with the manufacturer’s instructions.

NOTE: Epoxy resin joints should only be used where the joint is designed for use with epoxy resin.

9.14.5 Cement mortar joints (CM)

Cement mortar shall comply with Clause 2.7.2.

9.14.6 Silver brazed joints (SB)

Silver-brazed joints shall be made using silver brazing alloy complying with Clause 2.6.3.1. Joints shall be made by either—

(a) using authorized fittings; or

(b) fabricating junctions from the pipes using tools specially designed for the purpose.

9.14.7 Solvent cement joints (SC)

Solvent cement and priming fluid used for jointing plastic pipes and fittings shall comply with Clause 2.6.5.1 as appropriate.

9.14.8 Threaded joints (TH)

Threaded joints shall comply with the relevant Standards for the materials to be joined and be sealed with an authorized jointing material.

9.14.9 Band clamped sleeve joints (BC)

Band clamped sleeve joints shall comply with AS 1646.

9.14.10 PE-HD joints

PE-HD joints shall be installed in accordance with manufacturer’s instructions.
SECTION 9A REDUCED VELOCITY AERATOR STACK SYSTEM

9A.1 SCOPE AND GENERAL

9A.1.1 Scope
This Section specifies design and installation requirements for the reduced velocity aerator stack system for sanitary plumbing.

9A.1.2 General
Where the system uses an aerator junction fitting (a proprietary junction fitting) in the stack at each floor level for connection of graded discharge pipes, common discharge pipes or branch drains from sanitary fixtures, a de-aerator is required at the base of the stack.

Airflow requirements of the system are provided through the stack vent. Discharge pipes, common discharge pipes and branch drains that exceed the maximum allowable length or fixture unit loading shall be vented.

9A.2 SIZE OF STACKS

The stack shall be sized in accordance with Table 6.1, Table 7.1 and Table 7.2, and Clause 7.4, Items (a), (b), (c) and (e).

Where any stack is offset, the offset section shall be sized—

(a) as a straight stack, if the offset is more than 45° to the horizontal; or
(b) as a graded pipe, if the offset is less than 45° to the horizontal, and the stack shall continue undiminished in size.

The stack shall not be reduced in size in any direction.

9A.3 STACK VENTS

Stacks shall extend unimpeded to atmosphere. However, stack vents may be connected at their uppermost end into a common header terminating at one point.

If interconnected, interconnection of stack vents shall occur not less than 1 m above the highest flood rim level of the highest fixture. The size of header vent shall increase by one pipe size downstream of each interconnection junction (see Figure 9A.1).

The number of interconnected stacks shall not exceed 5 × DN 100 stacks or 4 × DN 125 stack, with a maximum size vent of DN 300 terminating through the roof being.

If the horizontal length of the stack vent offset exceeds 12 m, the size of the offset shall be increased by one pipe size (see Figure 9A.2).
9A.4 OFFSETS IN STACKS

The following applies:

(a) A double inline offset shall be installed midway if the distance between any two aerators or an aerator junction fitting and a de-aerator exceeds 5 m (see Figure 9A.3).

(b) A pressure relief by-pass pipe between the upper and lower sections of the stack shall be installed on every stack offset greater than 45° (see Figure 9A.4).

(c) The graded section of any offset shall be sized in accordance with Table 7.2.

(d) The minimum grade of stack offsets shall be in accordance with Table 7.8.

Connections near graded offsets shall be restricted in accordance with Clauses 7.6.2.3, 7.6.2.4 and 7.6.2.5.
If greater than 5 m install back to back offset using 45° bends (no pipe sections allowed)
FIGURE 9A.4 GRADED STACK OFFSET WITH PRESSURE RELIEF BY-PASS
9A.5 AERATOR JUNCTION FITTINGS

9A.5.1 General
An aerator junction fitting (see Figure 9A.5) shall be installed at each floor level that receives a soil or waste discharge.

9A.5.2 Opposed connections
Opposed connections of aerator junction fittings shall be connected only to equal numbers of fixtures of the same kind.

FIGURE 9A.5 TYPICAL AERATOR JUNCTION FITTING

9A.6 MAXIMUM LENGTH OF DISCHARGE PIPES
Any unvented discharge pipe or unvented common discharge pipe shall not exceed 10 m in length, and shall not include a vertical drop, between the crown of the trap and the invert of the junction, exceeding—

(a) 2 m for water closet pans with DN 80 discharge pipes;
(b) 1.5 m for basins and bidets; and
(c) 2.5 m for all other fixtures.

The length of a graded discharge pipe shall be in accordance with Appendix D.

9A.7 SIZE OF DISCHARGE PIPES
The size of a graded discharge pipe, common discharge pipe or branch drain shall be in accordance with Table 3.6 and Appendix D.

9A.8 DE-AERATORS
A de-aerator shall be installed at the base of the stack to provide a pressure relief by-pass between the stack and the drain to which it is connected (see Figure 9A.6).

The distance from the de-aerator to the closest aerator or double offset shall not exceed 5 m (see Figure 9A.3).

The pressure relief by-pass pipe on a de-aerator shall run at least 2.5 m from the centre-line of the stack to the centre of the pressure relief by-pass inlet junction (see Figure 9A.6). No connection shall be made into the by-pass pipe.
No connections shall be made to the de-aerator graded pipe within 2.5 m of the stack base (see Figure 9A.6).

Pressure relief by-pass pipes for de-aerators shall run parallel to the base of the de-aerator with the invert of the pressure relief by-pass pipe no lower than the centre-line of the drain (see Figure 9A.6).

When de-aerators are used for graded stack offsets, the pressure relief by-pass pipe shall run at least 0.5 m from the centre-line of the stack to the centre of the pressure relief by-pass inlet junction (see Figure 9A.4). No connections shall be made into by-pass pipe.

FIGURE 9A.6 DE-AERATOR WITH PRESSURE RELIEF BY-PASS PIPE AT THE BASE OF THE STACK
SECTION 10 PUMPE D DISCHARGE

10.1 SCOPE OF SECTION
This Section specifies requirements for pumped discharge.

10.2 GENERAL
Where permitted, pumping shall only be used where it is not practicable to gravitate to the connection. The pumping apparatus shall be positioned to facilitate easy connection to the gravity sewer.

The pumping apparatus may be one of the following:
(a) Compressed air ejection system.
(b) Wet well (including submersible pump).
(c) Small bore macerator/pump.

10.3 COMPRESSED AIR EJECTION
Ejector pots shall be sized according to maximum flow rates and may be duplicated. The pots shall be automatically controlled and shall be positioned on a firm base.

10.4 EJECTOR VENT
The ejector vent shall be not less than DN 40 and shall either—
(a) extend separately to open air; or
(b) be interconnected with a relief or stack vent at least 10 m above the ejector pot.

10.5 WET WELLS

10.5.1 General
Wet wells shall be fit for purpose and installed in an accessible location.

10.5.2 Construction
The structure shall be sound and constructed of materials that will resist corrosion from the sewage and sewage gases internally and aggressive soils externally.

10.5.3 Materials
Authorized materials include precast or cast in situ reinforced concrete, corrosion-resistant metals, brickwork or glass-reinforced plastics.

10.5.4 Base
The base shall be constructed or finished with a self-cleansing grade towards the pump inlet.

10.5.5 Cover
The cover shall be constructed of similar materials to that of the wet well and shall have access openings with removable airtight covers sized for maintenance purposes.

10.5.6 Ladders
Where a wet well exceeds a depth of 1.2 m, a ladder shall be provided in accordance with Clause 4.8.4.3.
10.6 INSTALLATION OF PUMPS

10.6.1 General
The pumps shall be suitable for unscreened sewage and shall be installed as follows:

(a) The pumping apparatus shall be securely fixed using corrosion-resistant fixings.

(b) Each pump shall be fitted with an isolating valve and check valve on the delivery side.

(c) Pumps shall be installed with connections to permit removal and replacement of the pump.

(d) Pumps shall be controlled so as to limit the number of starts per hour to within the capacity of the pump, and shall, as far as practicable, empty the contents of the wet well at each operation.

Pumps may be in duplicate.

NOTE: The required pumping rate should be based on an assessment of the expected inflow, holding capacity of the well and allowable discharge.

10.6.2 Inlet to wet well
The invert of the gravity discharge pipe to a wet well shall be located at least 100 mm above the highest working level and terminate with a square junction.

10.6.3 Venting
The wet well shall have a minimum DN 80 vent.

NOTE: Manufactured wet wells that are watermarked may be approved with a smaller vent size.

10.6.4 Sealing
All pipes or apparatus passing through the wet well walls or cover shall be sealed with a compatible material.

10.7 PUMPED DISCHARGES OR RISING MAINS
The pump discharge pressure piping shall comply with the relevant sections of AS/NZS 3500.1 and this Standard. The outlet pipe shall discharge to one of the following locations:

(a) An inspection chamber.

(b) A boundary trap shaft.

(c) A stack below the lowest fixture connection on any floor.

(d) A drain or combined discharge pipe, provided the connection is at least 2.5 m from any other connection.

(e) Downstream of a reflux valve or at least 2.5 m upstream of a reflux valve.

(f) A minimum of 1 m downstream of a boundary trap.

(g) Direct to the network utility operator’s sewer where approved by the network utility operator.
10.8 PUMP DISCHARGE FROM WASTE FIXTURES

10.8.1 General
Pumping shall only be permitted where gravity connection from a waste fixture is not possible. The pumping apparatus shall be positioned in the same room adjacent to the waste fixture.

10.8.2 Holding tank
The holding tank shall comply with Clauses 10.5.2, 10.5.4 and 10.5.5.

10.8.3 Provision of valves
Valves shall be provided as follows:
(a) Where the pump is located inside the holding tank, a non-return valve and isolating valve shall be located on the outlet side of the pump.
(b) Where the pump is located outside of the holding tank, an isolating valve shall be located on the inlet and outlet of the pump and a non-return valve shall be located on the downstream of the outlet isolating valve.

10.8.4 Inlet
The invert of each waste inlet shall be located at least 100 mm above the highest working level of the holding tank.

10.8.5 Outlet size
The pump discharge pipes shall be at least DN 25 and not less than the pump outlet size.

10.8.6 Venting
The holding tank shall be provided with a vent having a minimum size of DN 50 and shall comply with the venting requirements for waste fixtures. The vent shall be positioned a minimum of 100 mm above the waste inlet.

10.8.7 Pump discharge pipe
The pump discharge pipe from waste fixtures, or swimming pools, shall be connected in accordance with Clause 10.7, or connected to a gully riser as shown in Figure 10.1 or Figure 10.2.
Concrete surround (see Clause 4.6.2(c)(ii))

Gully grate (see Clause 4.6.2(b))

75mm

Finished surface level

Tapered joint to suit application

Pumped waste discharge

Concrete support for gully (see Clause 4.6.2(c)(i))

FIGURE 10.1 TYPICAL CONNECTION OF PUMPED WASTE DISCHARGE

10.9 ‘Text deleted’

Concrete surround (see Clause 4.6.2(c)(iii))

Invert level

Waste may discharge into branch

Grate (see Clause 4.6.2(b))

75 mm min.

150 mm

Finished surface level

Pumped discharge from swimming pool

Concrete support for gully (see Clause 4.6.2(c)(i))

FIGURE 10.2 TYPICAL CONNECTION OF PUMPED WASTE DISCHARGE FROM SWIMMING POOLS

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10.10 SMALL BORE MACERATOR PUMPS

Small bore macerator pumps shall discharge in accordance with Clause 10.7.

A vent pipe to a macerator pump shall terminate in accordance with Clause 6.8.4 or interconnect with any other vents other than those described in Clause 6.8.3.

NOTE: Small bore macerator pumps may not operate if air admittance valves are the sole means of venting the unit.

10.11 ELECTRICAL CONNECTION

All electrically operated pumping equipment shall be installed in accordance with the relevant requirements of AS/NZS 3000.
SECTION 11 FIXTURES AND APPLIANCES

11.1 SCOPE OF SECTION

This Section specifies requirements for the installation of sanitary fixtures and appliances, and their connection to the sanitary plumbing or sanitary drainage system.

NOTE: The requirements for the maximum lengths of discharge pipes without venting are given in Appendix D.

11.2 INSTALLATION OF SANITARY FIXTURES FOR PEOPLE WITH DISABILITY

The installation of sanitary fixtures for people with disabilities shall comply with AS 1428.1. In New Zealand, the requirements of the NZ Building Code shall apply.

11.3 GENERAL INSTALLATION REQUIREMENTS

11.3.1 Installation of fixtures

Fixtures and appliances shall be secured in position, independent of support from their traps, waste and discharge pipes or water supply connections. They shall be installed in a manner that facilitates disconnection.

11.3.2 Location of fixture traps or self-sealing devices

Fixture traps or self-sealing devices shall be installed downstream of the fixture outlets in accordance with Clause 6.4.3.

11.3.3 Untrapped fixtures

Untrapped fixtures that are permitted to discharge through a floor waste gully shall be connected in accordance with Table 4.4.

11.3.4 Connection of combination fixtures in pairs

Where a combination of waste fixtures is connected in pairs to a single fixture trap, the arrangement shall be in accordance with Clause 6.4.4.

11.3.5 Connection of soil fixtures

Soil fixtures shall not discharge through floor waste, overflow relief or disconnector gullies.

11.3.6 Fixture grates

Excluding water closet pans, slop hoppers, bedpan washers, bedpan sterilizers, tundishes, soil dump points and sanitary napkin disposal units, the outlet of each fixture shall be provided with a grate.

Where the fixture trap is not accessible, the grate shall be removable.

11.3.7 Sanitary flushing

The requirements for the sanitary flushing of fixtures and appliances shall be in accordance with AS/NZS 3500.1.

11.3.8 Fixture discharge pipes

Fixture and appliance discharge pipes shall be installed in accordance with the following:

(a) Clause 3.10 for direct to drain connections.

(b) Clause 3.11 and Clause 3.12 for unvented drains discharging to gullies.

(c) Clause 4.6.7 for floor waste gully connections.
(d) Table 4.1 for disconnector gully connections.
(e) Clause 6.5 for graded discharge pipe connections.
(f) Clause 7.3 for fully vented and fully vented modified stack connections.
(g) Clause 8.5 for single stack and single stack modified stack connections.
(h) Clause 9.12 for above-ground pipework and connection of fixtures using drainage principles.
(i) Section 9A for reduced velocity aerator stack systems.
(j) Appendix D.

11.4 PLANT ROOMS
Discharges from plant rooms shall drain to a tundish, trapped sump or floor waste gully. Fixture unit ratings shall be determined from Table 6.2.

11.5 PRESSURIZED CHAMBERS
Where a floor waste gully is located in a pressurized chamber, the trap shall be in accordance with Clause 6.4.2.

11.6 AUTOPSY TABLES
Autopsy tables shall be connected to sanitary drains in accordance with the following:
(a) Each autopsy table shall drain through an untrapped wastepipe not smaller than DN 50 and a maximum length of 1.2 m to a flushing floor waste gully with an outlet not smaller than DN 65.
(b) The water supply to the flushing floor waste gully shall be from a flush valve, cistern or break tank.

11.7 BAIN-MARIES AND BOILING WATER UNITS
Bain-maries and boiling water units shall drain to a tundish installed in accordance with Clause 11.21.

11.8 BASINS
Basins shall be fitted with a ON 40 (or ON New Zealand only) trap and a wastepipe not smaller than DN 40 or connected as fixture pairs in accordance with Clause 6.4.4.

11.9 BATHS
Baths shall be connected by—
(a) an untrapped wastepipe not smaller than DN 40 to a floor waste gully in accordance with Table 4.4 or;
(b) a trap and wastepipe not smaller than DN 40.
Where a bath trap is not accessible, the bath shall discharge untrapped to a floor waste gully (FWG) in accordance with Table 4.4 and Appendix D.

11.10 BEDPAN WASHERS AND SANITIZERS
Bedpan washers and sanitizers shall be fitted with traps and discharge pipes not smaller than DN 80.
11.11 BIDETS
Bidets and bidettes shall be connected by—
(a) an untrapped wastepipe not smaller than DN 40 (or DN 32, New Zealand only) to a floor waste gully; or
(b) a trap and wastepipe not smaller than DN 40 (or DN 32, New Zealand only).

11.12 DENTAL UNITS
11.12.1 Single
A single dental unit shall discharge through a sealed trap not smaller than DN 40.

11.12.2 Multiple
Multiple dental units draining to a common point shall discharge through a sealed trap not smaller than DN 50.

11.13 DRINKING FOUNTAINS
Drinking fountains shall be fitted with a DN 40 (or DN 25, New Zealand only) trap and a wastepipe not smaller than DN 40 (or DN 32 New Zealand only).

11.14 FOOD WASTE DISPOSAL UNITS (DOMESTIC TYPE)
The outlet of a waste disposal unit may be connected directly to the trap of an adjoining kitchen sink [see Figure 11.1 (c)].

11.15 REFRIGERATED, DEEP-FREEZE CABINETS, COMMERCIAL COFFEE-MAKING MACHINES AND ICE-MAKING MACHINES
Outlet pipes from refrigerated and deep-freeze cabinets, commercial coffee-making machines and ice-making machines shall be connected to a tundish installed in accordance with Clause 11.21 or discharge above the inlet to a self-sealing device.

11.16 MACERATING SANITARY NAPKIN DISPOSAL UNITS
Macerating sanitary napkin disposal units shall not discharge to a floor waste, overflow relief or disconnector gully.

11.17 SHOWERS
11.17.1 Individual showers
An individual shower shall be fitted with a minimum DN 80 grate or channel grate, and shall be connected by—
(a) an untrapped wastepipe not smaller than DN 40 to a floor waste gully;
(b) a trap and wastepipe not smaller than DN 40.

NOTE: Prefabrication shower bases are to be supported in accordance with the manufacturer’s instructions.

11.17.2 Shower groups
Shower groups may drain individually, as fixture pairs in accordance with Clause 6.4.4 or to a common channel.

11.17.3 Common channels
Common channels shall—
(a) be graded to the outlet; and
(b) discharge through a removable grate, trap and discharge pipe as given in Table 11.1.

**TABLE 11.1**  
**SIZE OF SHOWER DRAINAGE CHANNEL OUTLETS**

<table>
<thead>
<tr>
<th>Numbers of showers</th>
<th>Sizes of grate DN</th>
<th>Size of trap and discharge pipe DN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>2 or 3</td>
<td>80</td>
<td>50</td>
</tr>
<tr>
<td>4 to 6</td>
<td>100</td>
<td>65</td>
</tr>
</tbody>
</table>

11.18 SINKS

11.18.1 Kitchen sinks

Kitchen sinks shall be connected by using a fixture trap and wastepipe not smaller than DN 50 or DN 40 (New Zealand only) or as fixture pairs in accordance with Clause 6.4.4 directly to a stack, sanitary drain or overflow relief or disconnector gully.

Triple bowl domestic kitchen sinks shall be connected—

(a) as three single bowl sinks;
(b) as a fixture pair and one single bowl sink; or
(c) through a single fixture trap, provided the length of discharge pipe between the sink outlets and the fixture trap seal is not greater than 1.2 m.

11.18.2 Bar sinks

Bar sinks (domestic) shall be connected by—

(a) an untrapped wastepipe not smaller than DN 40 to a floor waste gully; or
(b) a trap and wastepipe not smaller than DN 40.

Bar sinks (commercial) shall be connected by—

(i) an untrapped wastepipe not smaller than DN 50 to a floor waste gully; or
(ii) a trap and wastepipe not smaller than DN 50.

11.18.3 Cleaners' sinks

Cleaners' sinks shall be connected to drains by—

(a) an untrapped wastepipe not smaller than DN 50 to a floor waste gully; or
(b) a trap and wastepipe not smaller than DN 50.

11.18.4 Pot, utility and laboratory sinks

Pot, utility or laboratory sinks shall be connected by using a trap and wastepipe not smaller than DN 50.

Pot, utility or laboratory sinks shall not be connected as fixture pairs.

**NOTE:** Trade waste discharge from pot, utility or laboratory sinks may require pre-treatment as determined by the network utility operator.

11.19 SLOP HOPPERS

11.19.1 Connection

Slop hoppers shall be connected directly to soil stacks or drains with a discharge pipe not smaller than DN 100.
11.19.2 Installation
Slop hoppers shall be installed and secured—
(a) on bedding not thicker than 20 mm; or
(b) in accordance with manufacturer’s instructions, provided the installation procedure is not in conflict with this Standard.

11.20 INSTRUMENT STERILIZERS AND AUTOCLAVES
Instrument sterilizers and autoclaves shall discharge over a tundish installed in accordance with Clause 11.21.

11.21 CONNECTION OF TUNDISHES
Tundishes may be connected—
(a) to a wastepipe not smaller than DN 25 in accordance with Clause 4.6.7.8;
(b) to a trapped wastepipe not smaller than DN 40 in accordance with Appendix D; or
(c) to a fixture trap.
When the tundish and discharge pipe is connected to a fixture trap—
(i) the connection shall be made above the level of the water seal; and
(ii) the top of the tundish shall be above the flood level rim of the fixture.
Pipes discharging over a tundish shall have an air gap of a size at least twice the internal diameter of the discharging pipe.
Tundishes shall be accessible.

11.22 DOMESTIC SWIMMING POOLS
The discharge from swimming pools shall be installed in accordance with Clause 10.9.
Overflows from skimmer boxes of domestic swimming pools shall discharge to an authorized discharge point nominated by the authority having jurisdiction.

11.23 TROUGHS
11.23.1 Ablution
Ablution troughs shall be connected by—
(a) an untrapped wastepipe not smaller than DN 40 to a floor waste gully; or
(b) a trap and wastepipe not smaller than DN 50.

11.23.2 Laundry
Laundry troughs shall be connected by—
(a) an untrapped wastepipe not smaller than DN 40 to a floor waste gully; or
(b) a trap and wastepipe not smaller than DN 40.
11.24 URINALS

11.24.1 Slab type
Slab type urinals shall be connected directly to soil stacks or drains with a trap and discharge pipe not smaller than DN 65 for urinal walls up to 5 m in length. Additional outlets are required where the urinal wall is more than 5 m in length.

11.24.2 Wall-hung

11.24.2.1 General
The floor of a room containing one or more wall-hung urinals shall grade to a floor waste gully installed in accordance with Clause 4.6.7.

11.24.2.2 Flushing wall-hung urinals
Flushing wall-hung urinals (other than those with an integral trap) shall be connected to a trap not smaller than DN 40 (or DN 32, New Zealand only).

11.24.2.3 Non-flushing (waterless) urinals
Waterless wall-hung urinals with an integral cartridge seal or integral self-sealing mechanical device may be installed without an additional fixture trap or self-sealing mechanical device.

Prior to installing a waterless wall-hung urinal to an existing system, the installer shall determine the materials of the pipes in the existing system.

The undiluted discharge from the urinal shall not be transported through copper pipework.

11.24.3 Conversion to waterless urinals
Urinals shall not be converted into waterless urinals unless the wall-hung or slab urinal has been authorized for use as a waterless urinal, and the requirements of Clauses 11.24.2.1 and 11.24.2.3 have been satisfied.

11.25 WASHING MACHINES

11.25.1 Domestic clothes-washing machines
The pumped discharge from domestic clothes-washing machines shall be connected—

(a) over the rim or into the sud-saver connection of a laundry trough;

(b) into a trapped wastepipe not smaller than DN 40; or

(c) into trapped or untrapped wastepipe not smaller than DN 40 connected to a floor waste gully.

11.25.2 Domestic dishwashing machines
A typical connection of dishwashing machine is shown in Figure 11.1.
FIGURE 11.1 TYPICAL CONNECTION OF DOMESTIC DISHWASHING MACHINES

11.25.2.1 Discharge
The pumped discharge from domestic dishwashing machines shall be connected—
(a) into a trapped wastepipe not smaller than DN 40;
(b) above the water seal of a DN 50 trap fitted to the outlet of a kitchen sink; or
(c) through a household food waste disposal unit.

11.25.2.2 Connection of outlet hose
Outlet hoses of domestic dishwashing machines shall be connected in accordance with the following:
(a) Where the outlet hose is connected above the water seal of a sink trap it shall be looped as close as possible to the underside of the sink drainer or benchtop before being extended downwards to the connection.
(b) If the trapped wastepipe to which the connection is made discharges directly to the drain, stack or common discharge pipe, the outlet hose shall be extended at least to the top of the dishwashing machine before looping downwards to the trapped wastepipe.
11.25.3 Commercial clothes-washing machines
NOTE: Trade waste discharge from commercial clothes-washing machines may require pre-treatment as determined by the network utility operator.

11.25.4 Commercial dishwashing machines
Commercial dishwashing machines shall be connected to a fixture trap and wastepipe not smaller than DN 50.
NOTE: Trade waste discharge from commercial dishwashers may require pre-treatment as determined by the network utility operator.

11.25.5 Glass-washing machines
Glass-washing machines shall be connected by—
(a) an untrapped wastepipe not smaller than DN 40 to a floor waste gully;
(b) a trap and wastepipe not smaller than DN 40; or
(c) a pump-out hose fitted in the same manner as domestic dishwashing machine (see Clause 11.25.2).

11.26 UNTRAPPED FLOOR DRAINS
11.26.1 General
An untrapped floor drain may be installed for the purpose of draining wastewater spillage from a floor in case of overflow.

11.26.2 Restrictions on use
An untrapped floor drain shall not—
(a) be connected to any stack or discharge pipe that connects directly to the drain; or
(b) be installed in any room that contains a urinal.

11.26.3 Installation
Each untrapped floor drain shall—
(a) be fixed and supported in accordance with Clause 9.2;
(b) have a removable grate of at least DN 40; and
(c) be connected to a separate, graded discharge pipe of at least DN 40.

11.26.4 Termination of discharge pipe
The outlet from an untrapped floor drain shall be located so that the discharge cannot cause damage or be a nuisance, and shall terminate either—
(a) internally over a tundish connected to a floor waste gully, in accordance with Clause 4.6.7.8; or
(b) externally with a flap and within 100 mm above finished surface level.

11.27 WATER CLOSET PANS
11.27.1 Connection
Water closet pans shall be connected directly to soil stacks or sanitary drains with a discharge pipe not smaller than DN 80.
11.27.2 Installation

Water closet pans shall be securely fixed by—

(a) bedding no thicker than 20 mm;
(b) brackets;
(c) corrosion-resistant fasteners; or
(d) as specified by the manufacturer.
SECTION 12  MULTI-UNIT DEVELOPMENTS

12.1 SCOPE OF SECTION

This Section specifies the minimum requirements for the main lines of a sanitary drain located in a multi-unit development of three or more residential buildings.

NOTE: Where two or more Class 1 dwellings are located under the same roof, each individual dwelling is considered to be an individual building (see Building Code of Australia).

12.2 METHODS OF DESIGN

12.2.1 General

In a multi-unit development, provision shall be made for an inspection shaft, an overflow relief gully and an open upstream vent as described in Clause 12.2.3 Items (a), (b) and (c), at each individual residential building. Multi-unit developments of 20 or more residential buildings shall comply with either this Standard or the Sewerage Code of Australia.

12.2.2 Maintenance shafts

In multi-unit developments of 20 or more residential buildings, a maintenance shaft having ready access at ground surface for drain clearing equipment and television inspection shall be provided on the main lines of the sanitary drainage system, at each change of direction and main line junctions. The spacing of maintenance shafts along straight sections shall not exceed 150 m. No additional Inspection openings will be required on the main line of sanitary drains where maintenance shafts are installed.

12.2.3 Inspection shafts and overflow relief gullies and open upstream vents at each individual residential building

In multi-unit developments, provision shall be made at each individual residential building for the following:

(a) An inspection shaft in accordance with Clause 4.4.2, immediately upstream of the junction with the main line of the sanitary drain.

(b) Additional overflow relief from sewerage surcharge.

(c) An open upstream vent.

NOTE: Provided protection against sewage overflow has been made as specified in Clause 4.6.6, any additional gully may have a lesser vertical separation than that specified in Clause 4.6.6.
SECTION 13 TESTING OF SANITARY PLUMBING AND SANITARY DRAINAGE INSTALLATIONS

13.1 GENERAL

This Section specifies requirements for the inspection and testing of sanitary plumbing and sanitary drainage installations.

All new, repaired or replaced sanitary plumbing and sanitary drainage shall be tested by hydrostatic, air pressure or vacuum testing to demonstrate that they are watertight. Testing shall be conducted prior to the placement of the trench fill (backfill).

Any defects shall either be repaired or replaced with pipes and fittings of a suitable material and the repaired or replaced section retested until it complies with this Section.

Sanitary fixtures shall be tested by subjecting them to normal use. After each test, the residual water seal in the trap of the fixture concerned or in any other trap connected to the same system shall, under normal operating conditions, retain a water seal of not less than 25 mm.

Where a water seal of not less than 25 mm cannot be retained under normal operating conditions, the installer shall inspect the sanitary plumbing and drainage system to determine the cause and undertake modifications or repairs, or both, and retest the sanitary fixture until it complies with this Clause.

In some cases it may be more cost-effective to renovate the existing drain using an approved trenchless rehabilitation technique, in which case the drain shall be tested and inspected after renovation.

Any renovation defects shall either be repaired or replaced with pipes and fittings of a suitable material and the repaired or replaced section retested and reinspected until it complies with this Section.

13.2 HYDROSTATIC TEST (WATER TEST)

Where the authority having jurisdiction or the network utility operator has a water management strategy that prohibits the use of water for specific purposes or has instituted water restrictions, hydrostatic testing of pipework may not be permitted, in which case an air or vacuum test shall be undertaken to verify that the sanitary plumbing and drainage pipework is satisfactory.

Where hydrostatic testing is used as a means for testing sanitary plumbing and sanitary drainage installations, non-drinking water may be used.

The sanitary plumbing and sanitary drainage shall be filled with water—

(a) in the case of sanitary drainage, to a height of not less than 1 m above the soffit level at the highest point of the section being tested;

(b) in the case of sanitary plumbing, to the spill level of the highest fixture or to the flood level of the lowest sanitary fixture, whichever is higher; and

(c) in either case, not exceeding 3 m at the lowest point of the test section.

The pressure shall be maintained without leakage for at least 15 min. The source of any leak shall then be ascertained and any defects repaired. The section under test shall then be retested.
13.3 AIR PRESSURE TEST

13.3.1 Sealing inlets and outlets

All sanitary plumbing and drainage inlets, outlets and access openings shall be capped and sealed. Air shall be introduced slowly into the section being tested.

13.3.2 Air pressure test procedure

An initial test pressure of approximately 15 kPa shall be applied to the section being tested. When approximately 15 kPa has been reached, the air pump and supply valve shall be shut off. Air pressure shall be allowed to stabilize for a minimum of 3 min while checking for leaks.

After the pressure has stabilized, commence the test by allowing the pressure to fall to 10 kPa and then begin recording the time and drop in pressure over the minimum test duration specified in Table 13.1.

13.3.3 Maximum pressure drop permitted

The section of sanitary plumbing or sanitary drainage being tested shall not have a drop in pressure greater than 3 kPa over the minimum test duration specified in Table 13.1.

13.4 VACUUM TEST

13.4.1 Sealing inlets and outlets

All sanitary plumbing and drainage inlets, outlets and access openings shall be capped and sealed.

13.4.2 Vacuum test procedure

An initial vacuum test pressure of approximately 15 kPa shall be applied to the section being tested. When approximately 15 kPa has been reached, the vacuum pump and supply valve shall be shut off. The vacuum shall be allowed to stabilize for a minimum of 3 min while checking for leaks.

After the pressure has stabilized, commence the test by allowing the vacuum to fall to 10 kPa and then begin recording the time and drop in vacuum over the minimum test duration specified in Table 13.1.

13.4.3 Maximum vacuum drop permitted

The section of sanitary plumbing or sanitary drainage being tested shall not have a drop in vacuum greater than 3 kPa over the minimum test duration specified in Table 13.1.

| TABLE 13.1 |
| AIR PRESSURE AND VACUUM AIR TESTING ACCEPTANCE TIMES FOR 3 kPa PRESSURE CHANGE |

<table>
<thead>
<tr>
<th>Pipe size</th>
<th>Test length, m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50</td>
</tr>
<tr>
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13.5 CLOSED CIRCUIT TELEVISION (CCTV) INSPECTION

NOTE: Where closed circuit television inspection of sanitary plumbing and drainage is required, it should be carried out by a suitably qualified expert in accordance with the requirements of Appendix E.
APPENDIX A

NORMATIVE REFERENCES

(Normative)

AS
1074 Steel tubes and tubulars for ordinary service
1345 Identification of the contents of pipes, conduits and ducts
1379 Specification and supply of concrete
1428 Design for access and mobility (All parts)
1432 Copper tubes for plumbing, gasfitting and drainage applications
1478 Chemical admixtures for concrete, mortar and grout
1478.1 Part 1: Admixtures for concrete
1566 Copper and copper alloys—Rolled flat products
1589 Copper and copper alloy waste fittings
1604 Specification for preservative treatment
1604.1 Part 1: Sawn and round timber
1631 Cast grey and ductile iron non-pressure pipes and fittings
1646 Elastomeric seals for waterworks purposes
1657 Fixed platforms, walkways, stairways and ladders—Design, construction and installation
1741 Vitrified clay pipes and fittings with flexible joints—Sewer quality
2129 Flanges for pipes, valves and fittings
2870 Residential slabs and footings—Construction
3501 Parallel screw threads of Whitworth form (BSW and BSF) and associated gauges and gauging practice
3517 Capillary fittings of copper and copper alloy for non-pressure sanitary plumbing applications
3571 Plastics piping systems—Glass-reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin
3517.1 Part 1: Pressure and non-pressure drainage and sewerage (ISO 10467:2004, MOD)
3600 Concrete structures
3688 Water supply—Copper and copper alloy body compression and capillary fittings and threaded-end connectors
3795 Copper alloy tubes for plumbing and drainage applications
4087 Metallic flanges for waterworks purposes
4139 Fibre reinforced concrete pipes and fittings
5200 Plumbing and drainage products
5200.000 Part 000: Procedures for certification of plumbing and drainage products

AS/NZS
1167 Welding and brazing—Filler metals
1167.1 Part 1: Filler metal for brazing and braze welding
1167.2 Part 2: Filler metal for welding

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<table>
<thead>
<tr>
<th>AS/NZS</th>
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<th>PVC-U pipes and fittings for drain, waste and vent applications</th>
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<td>Installation of polyethylene pipe systems</td>
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<td>Ductile iron pressure pipes and fittings</td>
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<td>Grey iron pressure fittings</td>
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<td>Hot-dip galvanized (zinc) coatings on fabricated ferrous articles</td>
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<td>Air admittance valves (AAVs) for use in sanitary plumbing and drainage systems</td>
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<td>PVC-U maintenance shafts</td>
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<td>Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications</td>
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<td>Plastics piping systems for soil and waste discharge (low and high temperature) inside buildings—Polypropylene (PP)</td>
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<td>Specification for chemical admixtures for concrete</td>
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<td>Specification for the minimum requirements of the NZ Timber Preservation Council Inc.</td>
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<td>Code of practice for industrial identification by colour, wording or other coding</td>
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<td>Code of practice for the installation of unplasticized PVC pipe systems</td>
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<td>Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads</td>
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<td>Organization</td>
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<td>Glass plant, pipeline and fittings</td>
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<td>Standard Specification for Seamless and Welded Austenitic and Ferritic/Austenitic Stainless Steel Sanitary Tubing</td>
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<td>Plumbing Code of Australia</td>
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<td>New Zealand Building Code (G13/AS2, Foul water, acceptable solution)</td>
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<td>Industry Standard for ABS Non-pressure Pipe and Fittings</td>
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## APPENDIX B

### PIPE GRADES CONVERSION TABLE

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<th>Conversion of pipe grades</th>
<th>Percentage, %</th>
<th>Ratio (gradient)</th>
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<td></td>
<td>20.00</td>
<td>1 in 5</td>
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<tr>
<td></td>
<td>6.65</td>
<td>1 in 15</td>
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<tr>
<td></td>
<td>5.00</td>
<td>1 in 20</td>
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<tr>
<td></td>
<td>3.35</td>
<td>1 in 30</td>
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<tr>
<td></td>
<td>2.50</td>
<td>1 in 40</td>
</tr>
<tr>
<td></td>
<td>2.00</td>
<td>1 in 50</td>
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<tr>
<td></td>
<td>1.65</td>
<td>1 in 60</td>
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<tr>
<td></td>
<td>1.45</td>
<td>1 in 70</td>
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<td>1 in 90</td>
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<tr>
<td></td>
<td>1.00</td>
<td>1 in 100</td>
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<td></td>
<td>0.85</td>
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<td>0.70</td>
<td>1 in 140</td>
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<td>0.65</td>
<td>1 in 150</td>
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<td></td>
<td>0.60</td>
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<td>0.50</td>
<td>1 in 200</td>
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<td></td>
<td>0.40</td>
<td>1 in 250</td>
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<td></td>
<td>0.35</td>
<td>1 in 300</td>
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</table>

**NOTE:** The percentage figures have been rounded off to the nearest 0.05%.
APPENDIX C

ACCEPTABLE PIPES AND FITTINGS

(Normative)

The following pipes and fittings are deemed to be acceptable solutions subject to the limitations of Clause 2.4:

(a) ABS non-pressure pipe and fittings in accordance with WSA 117.
(b) Cast iron fittings (gray cast iron) in accordance with AS/NZS 2544.
(c) Copper pipes and fittings in accordance with AS 1432 (A, B, C or D) or AS 3501.
(d) Copper alloy pipes in accordance with AS 3795.
(e) Copper and copper alloy fittings in accordance with AS 3688, AS 1589 and AS 3517.
(f) Ductile iron pipes and fittings in accordance with AS/NZS 2280.
(g) Fibre reinforced cement (FRC) pipes and fittings in accordance with AS 4139.
(h) Galvanized steel pipes and fittings in accordance with AS 1074 or NZS/BS 1387.
(i) Glass-filament-reinforced thermosetting plastic (GRP) pipe in accordance with AS 3571.
(j) High density polyethylene (PE-HD) pipes and fittings in accordance with AS/NZS 4401.
(k) High grade, low thermal expansion, borosilicate glass in accordance with BS 2598-4.
(l) Polypropylene pipes in accordance with AS/NZS 7671, for above ground use only or AS/NZS 5065.
(m) Stainless steel (SS) pipes and fittings in accordance with ASTM A270.
(n) Unplasticized polyvinyl chloride (PVC-U) pipes and fittings in accordance with AS/NZS 1260.
(o) Vitrified clay pipes and fittings in accordance with AS 1741 or BS EN 295-1.
# APPENDIX D

## MAXIMUM LENGTH (m) OF FIXTURE DISCHARGE PIPE WITHOUT VENTING

(Normative)

<table>
<thead>
<tr>
<th>Fixture</th>
<th>Floor waste gully</th>
<th>Disconnecter gully</th>
<th>Vented drain</th>
<th>Reduced velocity aerated stack system</th>
<th>Fully vented (modified)</th>
<th>Single stack</th>
<th>Single stack (modified)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTOPSY TABLE—shall discharge through a flushing floor waste gully</td>
<td>Ref. Clause 4.6.7.3 Figure 4.2 Table 4.4 (see Notes 3 &amp; 5)</td>
<td>Ref. Clause 4.6 Table 4.1</td>
<td>Ref. Clause 3.10 Figure 3.6 Table 3.6</td>
<td>Ref. Clause 9A.6</td>
<td>Ref. Clause 7.5.7.5.4 Figure 7.11</td>
<td>Ref. Clause 8.2 Figure 8.1 Table 8.2</td>
<td>Ref. Clause 8.2 Table 8.2</td>
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<tr>
<td>Untrapped DN 50 waste to flushing floor waste gully</td>
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<td>NP</td>
<td>NP</td>
<td>NP</td>
<td>NP</td>
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<td>Untrapped DN 50 waste to minimum DN 65 flushing floor waste gully</td>
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<td>BAIN-MARIE and WATER BOILER</td>
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<td>DN 40 trap and waste</td>
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<th>Fixture</th>
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<th>Disconnector gully</th>
<th>Vented drain</th>
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<th>Fully vented (modified)</th>
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<td>Ref. Clause 2.10 Figure 3.6</td>
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<th>Fixture</th>
<th>Floor waste gully</th>
<th>Disconnector gully</th>
<th>Vented drain</th>
<th>Reduced velocity aerated stack system</th>
<th>Fully vented (modified)</th>
<th>Single stack</th>
<th>Single stack (modified)</th>
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<td>(Domestic dishwasher) waste outlet hose connecting to riser of kitchen sink trap—</td>
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<td>6.0</td>
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<th>Disconnector gully</th>
<th>Vented drain</th>
<th>Reduced velocity aerated stack system</th>
<th>Fully vented (modified)</th>
<th>Single stack</th>
<th>Single stack (modified)</th>
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<tr>
<td>POTATO PEELER—shall discharge through a peel trap</td>
<td>Ref. Clause 4.6.7.3 Figure 4.2 Table 4.4 (see Notes 3 &amp; 5)</td>
<td>Ref. Clause 4.6 Table 4.1</td>
<td>Ref. Clause 3.10 Figure 3.6 Table 3.6</td>
<td>Ref. Clause 7.5.7.5.4 Clause 7.5.7.5.5 Figure 7.11 Table 8.2</td>
<td>Ref. Clause 8.2.3 Table 8.2</td>
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<tr>
<th>Fixture</th>
<th>Floor waste gully</th>
<th>Disconnecter gully</th>
<th>Vented drain</th>
<th>Reduced velocity aerated stack system</th>
<th>Fully vented (modified)</th>
<th>Single stack</th>
<th>Single stack (modified)</th>
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<tr>
<td></td>
<td>Ref. Clause 4.6.7.3 Figure 4.2 Table 4.4 (see Notes 3 &amp; 5)</td>
<td>Ref. Clause 4.6 Table 4.1</td>
<td>Ref. Clause 3.10 Figure 3.6 Table 3.6</td>
<td>Ref. Clause 7.5.7.5.4 Clause 7.5.7.5.5 Figure 7.11</td>
<td>Ref. Clause 8.2 Figure 8.1 Table 8.2</td>
<td>Ref. Clause 8.2.3 Figure 8.2 Table 8.2</td>
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<td>TUNDISHES (minor discharge)</td>
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</tbody>
</table>

NOTES:
1. NP = not permitted.
2. For the topmost fixture to fully vented modified stacks, see Clause 7.5.1.2.
3. Wastepipes to floor waste gullies shall not be extended by venting.
4. ‘Minor discharge’, approximately a minimum of 1 L per day and not more than 20 L per day.
5. For submerged-inlet floor waste gullies the requirements are specified in Table 4.4.
6. For connections of fixtures in range, see Clause 8.5.10.
7. Over 5 m of urinal wall additional outlets required.
8. Discharge through a DN 100 tundish or installed to manufacturer’s instructions.
9. See Clause 8.4.2, Item (a) for connection of slab type urinals to single stacks.
APPENDIX E

CONDUCT OF INSPECTIONS BY THE USE OF CLOSED CIRCUIT TELEVISION (CCTV)

(Informative)

E1 GENERAL

CCTV inspections are effective ways to identify the structural condition of sanitary plumbing and drainage installations and to identify and report on any specific defects or features.

Inspections should be conducted under no-flow conditions; that is the sanitary plumbing system is not being used so that the flow (water) level may be measured and reported.

Typical applications for CCTV Surveys include—

(a) inspection of drains, sewers and pipelines;
(b) inspection of deep shafts;
(c) inspection of ducts;
(d) monitoring specialist repair works in sewers; and
(e) surveys of industrial process pipelines.

Where required, specialized instruments, apparatus and/or software should be used to facilitate the survey. Hardware and software used in measuring the parameters have to be correctly calibrated for each application using the manufacturer’s recommended methods.

NOTE: It is recommended that CCTV operators are trained to conduct CCTV inspections and investigations.

E2 OPERATORS REPORT

The operator should provide a written report in hard copy and/or electronic format on the location and characteristics of reportable features, including defects and features of interest together with such header details necessary to define the details of the inspection.

Reports have to be prepared and submitted in hard copy. Reports should include a summary of all recorded defects and observations where the authority having jurisdiction is required to make a determination for acceptance.

The report should contain, but not be limited to, the following:

(a) Location of the sanitary plumbing and drainage installation.
(b) The date(s) of inspections.
(c) Details as required to identify the drain(s) inspected.
(d) Size and type of material installed.
(e) Condition of the sanitary plumbing and drainage installation.
BIBLIOGRAPHY

AS
3706 Geotextiles—Methods of test
3706.0 Part 0: General introduction and list of methods

BCA Building Code of Australia
AMENDMENT CONTROL SHEET

AS/NZS 3500.2:2003

Amendment No. 1 (2005)

REVISED TEXT
SUMMARY: This Amendment applies to the Clauses 1.3, 1.4, 2.4.4, 3.9.3.1, 3.11.2, 3.18, 4.7.1.1, 4.7.4, 6.6.1, 6.6.2, 6.6.5.1, 6.9.2, 6.9.4, 6.10, 7.5.3.1, 7.6.2.7, 8.2.3, 8.5.3 (new), 1.3.4, 11.25.2.3, 13.2, Sections 9A (new), 10 and 12, Appendix C, Table 6.1, and Figures 6.8, 6.9 (new), 6.10 (new), and 7.10.
Published on 10 November 2005.

Amendment No. 2 (2006)

REVISED TEXT
SUMMARY: This Amendment applies to the Clauses 4.6.7.2, 4.6.7.3, 4.6.7.7, 4.6.7.10, 6.9.2, 13.2.1 (new), 13.2.2 (new), Table 4.4 and Appendix D.
Published on 7 August 2006.

Amendment No. 3 (2010)

REVISED TEXT
SUMMARY: This Amendment applies to the Inside front cover, Preface, Preface, Clauses 1.2, 1.6, 1.7(new), 2.2, 2.3, 2.4.5, 2.6.1, 2.6.3.1, 2.6.3.2, 2.6.5.2, 3.3.1, 3.3.5, 3.3.8, 3.7.2, 3.7.3, 3.7.4, 3.8.1, 3.8.2, 3.9.1, 3.9.3.2, 3.9.3.3, 3.10.3, 3.11.1, 3.13, 3.16, 3.18, 3.19.2, 3.19.3, 3.19.4, 3.20(new), 4.2.1, 4.2.2, 4.3.1, 4.3.2, 4.5.1, 4.6.2, 4.6.3, 4.6.4, 4.6.5, 4.6.6.2, 4.6.6.5, 4.6.6.6, 4.6.6.7, 4.6.6.8, 4.6.7.2, 4.6.7.6, 4.6.7.8, 4.6.7.9, 4.6.7.10, 4.6.8.1, 4.6.8.2, 4.9.1, 4.9.2, 4.9.3, 4.9.4(new), 4.9.5(new), 4.10, 4.11.1, 5.2.4, 5.2.6, 5.3, 5.4.1, 5.4.2, 5.5, 5.5.1, 5.5.2, 5.5.3, 5.6, 6.1, 6.4.1, 6.5.2, 6.6.1, 6.6.2, 6.6.3, 6.6.4, 6.6.5.1, 6.6.5.2, 6.7.3, 6.7.4(new), 6.8.2, 6.9.2, 7.5.1.1, 7.5.3.4, 7.5.7.4, 8.4.1, 8.4.2, 8.5.6, 8.5.9, 8.6.3, 8.8.2, 8.8.3, 9.2.3, 9.5.1, 9.5.2, 9.5.3, 9.5.4(new), 9.6.3.1, 9.6.3.2, 9.7, 9.12.2, 9.12.3, 9.12.4, 9.14.7, 10.5.1, 10.5.4, 10.6.1, 10.6.2, 10.6.3, (1.7, 10.8.1, 10.8.3, 10.8.4, 10.8.5, 10.8.7, 10.9, 10.10, 12.2.3, Sections 6A(new), 9A, 11, and 13, Tables 1.1, 3.2, 3.4, 4.1, 4.3, 4.6, 6.1, 6.6, 9.1A(new), 9.2, Figures 3.5(A)(new), 3.6, 3.10, 3.11, 3.12(new), 3.13(new), 4.1, 4.3A(new), 4.6, 4.6A(new), 4.7, 6.3, 6.4, 6.5, 6.6, 7.10, 8.4, 8.9, 8.11, 8.18, 9.2, and Appendices A, C, D and E(new) and the Bibliography(new).
Published on 10 December 2010.
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Amendment No. 4
to
AS/NZS 3500.2
Plumbing and drainage
Part 2: Sanitary plumbing and drainage

REVISED TEXT

The 2003 edition of AS/NZS 3500.2 is amended as follows; the amendments should be inserted in the appropriate places.

SUMMARY: This Amendment applies to Clause 2.6.5.1 and Table 9.2.

Published on 23 December 2011.

Approved for publication in New Zealand on behalf of the Standards Council of New Zealand on 15 December 2011.

Clause 2.6.5.1

Delete Clause text and replace with the following:

Solvent cement and priming fluid used for jointing plastic pipes and fittings shall comply with AS/NZS 3879 as appropriate.

Solvent cement shall not be used without priming fluid.

NOTE: The colour of the priming fluid should be different from the colour of the solvent cement and the pipe to which it is applied. Generally, the priming fluid is pink, and the solvent cement is generally—

(a) for Type P PVC, green (Australia) or blue or gold (New Zealand);
(b) for Type N PVC, blue (Australia) or clear (New Zealand);
(c) for Type P ABS, grey; and
(d) for Type G, clear.

Table 9.2

Delete Table 9.2 (as amended by Amendment No. 3, 2010) and replace with the following:
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<table>
<thead>
<tr>
<th>To—Material 2</th>
<th>Cast and ductile iron</th>
<th>Copper and copper alloy</th>
<th>Galvanized steel</th>
<th>PP</th>
<th>PVC-U</th>
<th>PE</th>
<th>ABS/ASA</th>
<th>VC</th>
<th>FRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast and ductile iron</td>
<td>BG RR</td>
<td>BG RR* SB/ER</td>
<td>BG RR</td>
<td>BG RR</td>
<td>BG RR SC/ER BC</td>
<td>BG RR</td>
<td>BG RR RR/ER RR CM BC</td>
<td>RR BC</td>
<td></td>
</tr>
<tr>
<td>Copper and copper alloy</td>
<td>BG RR* ER/SC</td>
<td>SB RR</td>
<td>TH/SB RR</td>
<td>SC/TH SB SC/ER SB RR</td>
<td>RR SB/TH</td>
<td>SC/TH SB SC/ER SB RR</td>
<td>RR/SB RR/BG RR/ER CM BC</td>
<td>RR BC ER</td>
<td></td>
</tr>
<tr>
<td>Galvanized steel</td>
<td>BG RR</td>
<td>BG SB/TH SB/ER</td>
<td>TH BG</td>
<td>TH SC/TH SC/ER</td>
<td>RR TH SC/TH</td>
<td>RR TH SC/TH</td>
<td>RR CM RR RR/ER</td>
<td>RR BC</td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td>BG RR</td>
<td>SB/TH RR</td>
<td>TH RR</td>
<td>RR TH EF</td>
<td>RR SC/TH</td>
<td>RR SC/TH</td>
<td>RR CM RR RR/ER</td>
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<td></td>
</tr>
<tr>
<td>FRC</td>
<td>RR BC</td>
<td>RR BC</td>
<td>RR BC ER</td>
<td>RR BC ER</td>
<td>RR BC ER</td>
<td>RR BC ER</td>
<td>RR BC ER</td>
<td>RR BC ER</td>
<td>RR BC ER</td>
</tr>
</tbody>
</table>

* Applies to vent connections only.

**LEGEND:**
- BG = bolted gland
- SC = solvent cement
- RR = rubber ring
- ER = epoxy resin
- CM = cement mortar
- BC = band clamped sleeve
- EF = electrofusion
- SB = silver brazed

**NOTE:** Where more than one joint type is shown separated by one or more slashes, the joint between the two different materials requires an adaptor. The order of the joints is always shown from (Material 1) to (Material 2) as indicated in the Table headings.
REVISED TEXT

The 2003 edition of AS/NZS 3500.2 is amended as follows; the amendment(s) should be inserted in the appropriate place(s).

SUMMARY: This Amendment applies to the Inside front cover, Preface, Clauses 1.2, 1.6, 1.7(new), 2.2, 2.3, 2.4.5, 2.6.1, 2.6.3.1, 2.6.3.2, 2.6.5.2, 3.3.1, 3.3.5, 3.3.8, 3.7.2, 3.7.3, 3.7.4, 3.8.1, 3.8.2, 3.9.1, 3.9.3.2, 3.9.3.3, 3.10.3, 3.11.1, 3.13, 3.16, 3.18, 3.19.2, 3.19.3, 3.19.4, 3.20(new), 4.2.1, 4.2.2, 4.3.1, 4.3.2, 4.5.1, 4.6.2, 4.6.3, 4.6.4, 4.6.5, 4.6.6.2, 4.6.6.5, 4.6.6.6, 4.6.6.7, 4.6.6.8, 4.6.7.2, 4.6.7.6, 4.6.7.8, 4.6.7.9, 4.6.7.10, 4.6.8.1, 4.6.8.2, 4.9.1, 4.9.2, 4.9.3, 4.9.4(new), 4.9.5(new), 4.10, 4.11.1, 5.2.4, 5.2.6, 5.3, 5.4.1, 5.4.2, 5.5, 5.5.1, 5.5.2, 5.5.3, 5.6, 6.1, 6.4.1.1, 6.5.2, 6.6.1, 6.6.2, 6.6.3, 6.6.4, 6.6.5.1, 6.6.5.2, 6.7.3, 6.7.4(new), 6.8.2, 6.9.2, 7.5.1.1, 7.5.3.4, 7.5.7.4, 8.4.1, 8.4.2, 8.5.6, 8.5.9, 8.6.3, 8.8.2, 8.8.3, 9.2.3, 9.5.1, 9.5.2, 9.5.3, 9.5.4(new), 9.6.3.1, 9.6.3.2, 9.7, 9.12.2, 9.12.3, 9.12.4, 9.14.7, 10.5.1, 10.5.4, 10.6.1, 10.6.2, 10.6.3, 10.7, 10.8.1, 10.8.3, 10.8.4, 10.8.5, 10.8.7, 10.9, 10.10, 10.12, 12.2.3, Sections 6A(new), 9A, 11, and 13, Tables 1.1, 3.2, 3.4, 4.1, 4.3, 4.6, 6.1, 6.6, 9.1A(new), 9.2, Figures 3.5(A)(new), 3.6, 3.10, 3.11, 3.12(new), 3.13(new), 4.1, 4.3A(new), 4.6, 4.6A(new), 4.7, 6.3, 6.4, 6.5, 6.6, 7.10, 8.4, 8.9, 8.11, 8.18, 9.2, and Appendices A, C, D and E(new) and the Bibliography(new).

Published on 10 December 2010.

Approved for publication in New Zealand on behalf of the Standards Council of New Zealand on 4 June 2010.

---

Inside front cover

1. Delete ‘AUSTAP’ and replace with ‘Plumbing Products Industry Group’.
2. Delete ‘Department of Infrastructure, Energy and Resources (Tasmania)’ and replace with ‘Department of Justice (Tasmania)’.
3. Delete ‘Department of Local Government and Planning, Sports and Recreation (Queensland)’ and replace with ‘Department of Infrastructure and Planning (QLD)’.
4. Add ‘Fire Contractors Federation’.

---

Preface

Insert the following as the last paragraph of the Preface:

This Standard incorporates commentary on some of the clauses. The commentary directly follows the relevant clause, is designated by ‘C’ preceding the clause number and is printed in italics in a panel. The commentary is for information only and does not need to be followed for compliance with the Standard.

---

Clause 1.2

Delete Clause 1.2 and replace with the following:

---

NORMATIVE REFERENCES

The normative documents referenced in this Standard are listed in Appendix A.

NOTE: Documents referenced for informative purposes are listed in the Bibliography.
Clause 1.6
Delete second sentence.

Clause 1.7 (new) and Table 1.1 (new)
Add new Clause 1.7 as follows:

1.7 EQUIVALENT PIPE SIZES
Nominal sizes of pipes and fittings quoted in this Standard are applicable to all materials listed in Appendix C, except for polyethylene (PE) and polypropylene (PP). Where the nominal size of a pipe or fitting is specified in this Standard, an equivalent pipe size, appropriate to polyethylene and polypropylene pipes and fittings, shall be selected from Table 1.1.

<table>
<thead>
<tr>
<th>Nominal size DN</th>
<th>Equivalent OD for PE and PP</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>65</td>
<td>63</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>150</td>
<td>160</td>
</tr>
<tr>
<td>225</td>
<td>250</td>
</tr>
<tr>
<td>300</td>
<td>315</td>
</tr>
</tbody>
</table>

Clause 2.2
Delete text of Clause 2.2 and replace with the following:

Materials and products used in Australia for plumbing and drainage installations shall have been authorized in accordance with the Plumbing Code of Australia (PCA). In New Zealand product authorization is not required.

The Plumbing Code of Australia (PCA) requires the materials and product types listed in Table A.2.1 be certified under the WaterMark Certification Scheme. A schedule of materials and product types requiring authorization and relevant specifications is included in AS 5200.000.

NOTE: A database of authorized products is available from www.watermark.standards.org.au
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Clause 2.3

Delete Clause 2.3 and replace with the following:

2.3 SELECTION AND USE OF MATERIALS AND PRODUCTS

Materials and products used in sanitary plumbing and drainage shall be selected to ensure they are fit for their intended purpose.

The pipes and fittings shall be selected from those listed in Appendix C, unless otherwise approved by the authority having jurisdiction.

Factors to be taken into account in the selection shall include, but are not to be limited to, the following:

(a) The type of usage likely to occur and the nature of the wastewater and the other matter to be conveyed.

(b) The nature of the environment.

(c) The physical and chemical characteristics of the materials and products.

(d) The possibility of abrasion by solids in the flow, or of chemical attack.

(e) The range of temperatures from the discharge that the sanitary plumbing and drainage system will be exposed to.

(f) Accessibility for inspection, service, repair and replacement.

NOTE: Information on some of the above items may be obtainable from the supplier or manufacturer of the material or product.

Clause 2.4.5

Delete Item (b) and replace with the following:

(b) Vitrified clay pipes and fittings shall comply with AS 1741 or BS EN 295-1.

Vitrified clay pipes and fittings shall not be used above ground except where installed as a riser connected to a fixture in accordance with Clause 3.8.3, or as a drain under buildings in accordance with Clause 4.3.2(b).

Clause 2.6.1, Item (b)

Insert ‘(all parts)’ after AS/NZS 4331.

Clause 2.6.3.1

Replace ‘AS 1167.1’ with ‘AS/NZS 1167.1’.

Clause 2.6.3.2

Replace ‘AS 1167.1’ with ‘AS/NZS 1167.1’.

Clause 2.6.5.2

Replace ‘AS 2033’ with ‘AS/NZS 2033’.
Clause 3.3.1

*Delete Clause text and replace with the following:*

The size of a drain shall be determined by the number of fixture units and type of fixtures discharging into it. The fixture unit loading for each pipe size and grade shall not exceed the maximum specified in Table 3.1. Fixture unit ratings are given in Tables 6.1 and 6.2.

Clause 3.3.5

In the last sentence, replace ‘in line’ with ‘in common alignment’.

Clause 3.3.8

*Delete Clause text and replace with the following:*

A drain shall not be increased in size unless the fixture unit loading is in excess of the maximum allowable for that size drain at a particular grade, as specified in Table 3.1.

Table 3.2

*Delete Table, including Note, and replace with the following:*

<table>
<thead>
<tr>
<th>Nominal size DN</th>
<th>Minimum grade, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>2.50</td>
</tr>
<tr>
<td>80</td>
<td>1.65</td>
</tr>
<tr>
<td>100</td>
<td>1.65*</td>
</tr>
<tr>
<td>125</td>
<td>1.25</td>
</tr>
<tr>
<td>150</td>
<td>1.00</td>
</tr>
<tr>
<td>225</td>
<td>0.65</td>
</tr>
<tr>
<td>300</td>
<td>0.40</td>
</tr>
</tbody>
</table>

*Except for drains from septic tanks, sewage treatment plants and unvented discharge pipes from tundishes, which may have a minimum grade of 1.00%.

NOTE: Appendix B provides a Table for conversion of grades as a percentage to grades as a ratio.

Clause 3.7.2

*Delete Clause text and replace with the following:*

Drains shall be installed with a depth of cover, measured from the top of the pipe socket or inspection opening to the finished surface level, as specified in Table 3.4, unless the product-specific Standard specifies, or the manufacturer recommends, a greater depth of cover.
Table 3.4

Delete Table and replace with the following:

<table>
<thead>
<tr>
<th>Location</th>
<th>Minimum depth of cover, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject to vehicular traffic</td>
<td>300 500</td>
</tr>
<tr>
<td>All other locations</td>
<td>Nil 300*</td>
</tr>
</tbody>
</table>

*Except as provided in Clauses 3.7.3 and 3.7.4

Clause 3.7.3

1 Delete title and replace with the following:

3.7.3 Drains installed with less than minimum cover

2 Delete the last sentence before the Note and replace with the following:

The paving shall extend the full width of the trench, or the drain shall be adequately protected from mechanical damage.

Clause 3.7.4, Item (b)

Delete Item (b) and replace with the following:

(b) the drain is adequately protected from mechanical damage and superimposed loads.

Clause 3.8.1

Delete Clause text and replace with the following:

The footings for alterations or additions to buildings shall not be placed over or adjacent to existing drains until the clearances specified in Clause 3.8.2 have been provided. Alternatively, such drains shall be relocated.

Any existing gully, inspection shaft, or boundary trap riser shall not be permitted to remain under any such alterations or additions other than where specifically permitted in Clause 4.4.2.3, Clause 4.6.5 or Clause 4.6.6.5.

Clause 3.8.2

Delete Clause text and replace with the following:

The following applies to drains in close proximity to footings or foundations:

(a) Where a drain passes under a strip footing, its angle of intersection with the footing in the horizontal plane shall be not less than 45°, and the minimum clearance between the top of the drain to the underside of the footing shall be 25 mm.

(b) Drains laid through footings or walls, other than below-ground external walls, shall be installed with an annular space of not less than 25 mm filled with a liner of flexible material.
(c) Pipes may be laid through below-ground external walls provided—
   (i) two flexible joints are provided externally within 800 mm of the external face of the wall, and such joints are not less than 600 mm apart; and
   (ii) the penetration of the wall is made watertight.

(d) Where a drain is installed parallel to a footing, the trench shall be located as follows:
   (i) In Australia—
       (A) for single dwellings, as shown in Figure 3.4; and
       (B) for all other buildings or where the requirements of Item (A) cannot be achieved, a recognized expert shall be engaged to provide a design in accordance with the PCA.
   (ii) In New Zealand, as specified in NZBC Clause G13/AS2.

(e) Requirements for pile systems shall be determined by a suitably qualified expert as recognized so by the jurisdiction having authority.

---

**Clause 3.9.1**

1. *Delete* the word ‘and’ at the end of Item (e).

2. At the end of Item (f) *replace* the full stop with ‘; and ’. *Add* a new Item (g) and Note as follows:
   (g) in accordance with Clause 3.18 (d) for drains connected to vacuum sewerage systems.
   
   **NOTE:** Where air admittance valves are used, see Clause 6.9.

---

**Clause 3.9.3.2**

At the end of the first Paragraph *insert* ‘(see Figure 3.5(A))’.

---

**Clause 3.9.3.3**

*Delete* ‘Example’ and related text above Figure 3.5.
**Figure 3.5(A) (new)**

Insert new Figure 3.5(A) after Figure 3.5.

Example:

Total loading units discharging to drain = 36 FU.

Required size of drainage vent = DN 65—(Rating of 2) refer to Table 3.5.

The two other stack or drainage vents (assuming the branch drain is over 10 m) in combination may take the place of a single DN 65 or DN 50 vent.

NOTE: The section of drains to be vented shall not be reduced below the rating of venting required.

**FIGURE 3.5(A) TYPICAL EXAMPLE OF VENT SIZING**

**Clause 3.10.1**

Delete Item (b) and replace with the following:

(b) connections to a disconnector or overflow relief gully.
Delete Figure and replace with the following:

NOTE: Total length of branch connections to fixtures is not to exceed 10 m.

FIGURE 3.6 TYPICAL CONNECTIONS OF GROUND-FLOOR FIXTURES TO UNVENTED BRANCH DRAINS

Clause 3.11.1

Delete first Paragraph and replace with the following:

A drain that receives the discharge from waste fixtures only may be connected to a gully.

Clause 3.13

In the second line delete ‘Clause 6.6.1’ and ‘Figure 6.5’, and replace with ‘Clause 6.6’ and ‘Figure 6.4’.
Clause 3.16

Delete Clause and replace with the following:

3.16 RE-USE OF EXISTING SANITARY DRAINS

When a building containing sanitary plumbing and drainage is demolished or removed from site and a new building constructed, the following requirements shall apply to the use of existing sanitary drains up to the point of connection:

(a) Mortar-jointed vitrified clay, mortar-jointed concrete, asbestos cement and fibre-reinforced cement pipes shall not be re-used unless, where authorized by the authority having jurisdiction, they have been renovated using a structural plastics liner.

(b) Drains constructed of other authorized materials shall not be re-used unless they have been verified for compliance in accordance with the relevant clauses of this Standard and tested in accordance with Section 13 and found to be satisfactory.

Drains that do not comply shall be replaced or repaired and retested.

NOTES:

1. In the case of an existing building, where major alterations or additions that will involve additional fixtures being connected to the existing drain are to be carried out, consideration should be given to the requirements of this Clause.

2. If any section of the existing drain is found to be defective, then it should be satisfactorily repaired or a new section of drain should be installed.

Clause 3.18 [as per Amendment No. 1 (2005)]

Delete Clause text [including ‘Note’ as amended by Amendment No. 1 (2005)] and replace with the following:

Drains connected to vacuum sewerage systems shall be installed in accordance with the following:

(a) An inspection shaft connected to the drain with a junction shall be placed as close as practicable to, and upstream of, the collection tank.

(b) The junction inlet to the inspection shaft shall be against the grade of the drain so that any rodding of the line is in the direction away from the collection tank.

(c) Where more than one drain is connected to a collection tank, the spill level of both overflow gullies of the drains shall be installed level with each other wherever practicable.

(d) A DN 100 open vent pipe shall be provided at the upstream end of each drain connected to the collection tank and a DN 100 downstream vent shall be located within 10 m of the collection tank. No fixtures shall be connected between the collection tank and the downstream vent connection unless otherwise authorized by the authority having jurisdiction.

NOTES:

1. In addition to the open vents, air admittance valves, installed in accordance with Clause 6.9, may be used to provide additional venting of drains connected to a collection tank.

2. Jump-ups should be avoided.
Clause 3.19.2

Delete Clause text and replace with the following:

Drains connected to common effluent drainage systems shall be installed in accordance with the following:

(a) Discharge from fixtures shall pass through a septic tank. Where this is impracticable due to location and available fall, discharge from waste fixtures may pass through a sullage tank.

(b) Drains from septic or sullage tanks to the common effluent drain shall be not less than DN 80 and not more than DN 100 and shall be laid at a grade of not less than 1% (1 in 100).

(c) Induct vents shall not be installed on septic tanks. Where induct vents are installed on an existing septic tank, they shall be removed before connecting the septic tank to a common effluent drainage system.

(d) Inspection openings shall be provided in accordance with Clause 4.7 and shall be included on—
   (i) the inlet to an on-site wastewater treatment unit; and
   (ii) the outlet of the on-site wastewater treatment unit, within 2.5 m of the tank, where the connecting drain is greater than 10 m in length.

(e) Drains, both existing and new, shall be tested in accordance with Section 13.

(f) Soakage trenches, and stormwater, roof water and subsoil water drainage shall not be connected to a common effluent drainage system.

NOTE: Typical connections are shown in Figures 3.10, 3.11, 3.12 and 3.13.
FIGURE 3.10
TYPICAL SITE LAYOUT PLAN SHOWING CONNECTION DETAILS FOR AN ALL-WASTE SEPTIC TANK SYSTEM
FIGURE 3.11 TYPICAL CONNECTION OF SEPTIC TANK TO COMMON EFFLUENT DRAIN (EXISTING ALL-WASTE SEPTIC TANK INSTALLATION ONLY)
Add new Figure 3.12 after Figure 3.11

**FIGURE 3.12 TYPICAL CONNECTION DETAILS FOR AN ALL-WASTE SEPTIC TANK SYSTEM**

- DN 100 inspection opening
- DN 100 inspection opening
- DN 100 inspection opening
- Existing all-waste septic tank to be cleaned out and inspected
- Access cover shafted to surface level
- DN 100 inspection opening required within 2.5 m of septic tank outlet where connection length exceeds 30 m. Additional inspection shafts required at a minimum spacing of 30 m thereafter
- DN 100 drain min. grade 1% (1:100)
- Inspection shaft within 1.5 m of the boundary where no connection inspection shaft provided by network utility operator
- Depth and location of connection point obtained from the network utility operator
Add new Figure 3.13 after new Figure 3.12:

**FIGURE 3.13** TYPICAL CONNECTION DETAILS FOR A SEPTIC TANK AND SULLAGE TANK SYSTEM
Clause 3.19.3

*Add* the following ‘NOTE’ at the end of the Clause:

NOTE: In Australia, effluent dispersal should be in accordance with health regulator’s requirements.

---

Clause 3.19.4

1. *After the first paragraph insert* the following:
   
   Sullage tanks shall be inspected for soundness and hydrostatically tested before connection to the common effluent drainage system.

2. *Delete* Note 3.

---

Clause 3.20 (new)

*Add* new Clause 3.20 as follows:

3.20 ON-SITE WASTEWATER TREATMENT UNITS

On-site wastewater treatment units shall be installed in accordance with AS/NZS 1546.1, AS/NZS 1546.2 or AS/NZS 1546.3, as appropriate.

---

Clause 4.2.1

*Delete* first paragraph and *replace* with the following:

Drains connected to the network utility operator’s sewer shall be not less than DN 100.

---

Clause 4.2.2

*Delete* the first paragraph and *replace* with the following:

Whenever drainage works are carried out, necessary measures shall be taken to protect the network utility operator’s sewers from damage and to prevent the entry of—

---

Clause 4.3.1

*Add* the following Notes at the end of the Clause:

NOTES:

1. The person or authority having rights over an easement may have specific requirements for drains laid in proximity of the easement or for drains laid within or passing through the easement.

2. For protection against termite infestation under slab and penetrations of slab, see AS/NZS 3500.1.

---

Clause 4.3.2

1. *In the first line, delete* the words ‘in accordance with Clause 9.12 and the following:’ and *replace* with ‘as follows:’

2. *After Item (d), add* new Item (e), as follows:

   (e) The drain shall satisfy the requirements of Clause 3.6 as appropriate.
Clause 4.5.1

1. Add the words ‘and be accessible’ at the end of the first paragraph.

2. Add the following Note after the first paragraph:
   NOTE: This can be achieved by using either an access chamber or a riser shaft to the finished surface level.

Clause 4.6.2

Delete Clause text and replace with the following:

Gullies shall—

(a) be of the self-cleansing type;

(b) have the top of the gully riser provided with a grating to relieve surcharge; and

(c) where installed below ground—
   (i) be supported on a concrete footing of a thickness not less than 100 mm, with a width not less than 100 mm beyond the sides of the trap and extending upwards to not less than 100 mm above the base of the gully; and
   (ii) have the top of the gully riser protected from damage at finished surface level by means of a concrete surround or other authorized product.

Clause 4.6.3

Delete Clause text and replace with the following:

The water seal shall be permanently maintained in a gully (see Figure 4.1 for two examples) by—

(a) the discharge from a waste fixture or floor waste gully in accordance with Table 4.1;

(b) the discharge from a waste stack of not more than five floors in height;

(c) water from a hose tap located a minimum of 450 mm above the grating where no wastepipe discharges into gully;

(d) the discharge from temperature/pressure-relief valves and/or expansion control valves;
   NOTE: For temperature limitations, see Clause 2.3(e).

(e) the discharge from a charge pipe in accordance with Figure 4.3 and Clause 4.6.8; or

(f) discharges from refrigeration condensate lines.

Table 4.1

Delete ‘NOTE’ and replace with the following:

NOTES:

1. Bends to be kept to a minimum.

2. For New Zealand, bidets do not discharge to disconnector gullies.
**Clause 4.6.4**

_Delete Clause text and replace with the following:

Discharges from soil fixtures shall not connect, either directly or indirectly, to a disconnector or overflow relief gully. Surface water or roof water shall not enter any sanitary plumbing and drainage system, unless authorized to by the authority having jurisdiction.

**Clause 4.6.5**

_Delete Clause text and replace with the following:

A disconnector gully may be located within a building provided—

(a) the gully riser extends to the finished surface level and is sealed with a removable airtight cover;

(b) a DN 50 vent pipe, branching from the riser pipe or a fitting extends at a grade of not less than 1.25% and terminates with a grating at an external wall of the building—

(i) above the overflow level of the lowest internal fixture connected to the sealed disconnector gully;

(ii) at least 75 mm above the finished surface level; and

(iii) in areas likely to be inundated, in compliance with Clause 4.6.6.8;

(c) fixtures or appliances are not connected to the vent pipe; and

(d) air admittance valves are not used to vent sealed disconnector gullies.

Where it is not practicable to extend the vent to an external wall, the vent may terminate in the atmosphere external to a building in accordance with Clause 6.8.4.

**Clause 4.6.6.2**

1 _Delete ‘or’ at the end of Item (b).

2 _Delete the full stop at the end of Item (c) and replace with ‘; or’

3 _Add new Item (d) after Item (c) as follows:

(d) an alternative overflow relief point(s), equal to or the equivalent cross-section area of the drain served, is provided to the drainage systems.

**Clause 4.6.6.5**

_Delete Item (a) and replace with the following:

(a) Recessed within an external wall [see Figure 4.1(b)], provided—

(i) the recess is not less than 300 mm wide and 600 mm high, measured above the top of the gully riser;

(ii) the centre of the riser is no more that 300 mm from the face of the building and the riser is fully accessible; and

(iii) the base of the recess is graded away from the building.
Delete Figure 4.1 and replace with the following:

(a) Typical detail of overflow relief gully inside building

(b) Typical details of overflow relief gully positioned in recess
Clause 4.6.6.6
Delete Clause title and replace with the following:

4.6.6.6 Height of overflow point below lowest fixture

Clause 4.6.6.7
In the second line, delete the words ‘surrounding ground surface’ and replace with ‘finished surface’.

Table 4.3
1 In the last row of the first column, delete ‘Other fixtures’ and replace with ‘Other fixtures (includes greywater diversion devices)’.
2 In the second line of the ‘NOTE’, delete the word ‘backflow’ and replace with ‘overflow’.

Clause 4.6.6.8
Delete the last paragraph and replace with the following:

Where either of the above requirements cannot be achieved, no property drain shall gravitate to the network utility operator’s sewer.

Clause 4.6.7.2 [as per Amendment No. 2 (2006)]
Delete Clause text [as amended by Amendment No. 2, (2006)] and replace with the following:

Fixtures listed in Table 4.4, and fixture pairs in accordance with Clause 6.4.4, may be connected to floor waste gullies and, except for tundishes, shall be located within the same room as the gully.

Basins and drinking fountains that discharge to a floor waste gully shall have a trap installed immediately adjacent to the outlet of the fixture.

NOTE: Where it is known that the discharge may cause a foaming problem, fixtures should not be connected so as to discharge through a floor waste gully.

Clause 4.6.7.6
Delete Clause text and replace with the following:

Floor waste gullies shall be installed with an accessible removable grate and have a riser of not less than DN 80 to finished surface level. Where the sole function of the floor waste gully is to dispose of water spillage and wash-down water, a minimum DN 50 riser may be used.

Clause 4.6.7.8
Delete Clause text and replace with the following:

In addition to the discharges permitted in Table 4.4, tundishes receiving discharges from water heater drains, airconditioning units, other condensate lines, and the like, may discharge to a floor waste gully. The maximum length of the unvented discharge pipe shall not exceed 10 m (see Figure 4.3A).
NOTES:
1 Maximum unvented length 10 m.
2 DN 50 open vent required if more than 10 m (air admittance valve not permitted).
3 Sealed disconnector gully inside building installed in accordance with Clause 4.6.5.
4 DN 100 at minimum grade 1:100.

FIGURE 4.3A  TYPICAL UNTRAPPED TUNDISH CONNECTION TO SEALED DISCONNECTOR GULLY VIA SEALED FLOOR WASTE GULLY

Clause 4.6.7.9

Delete text and replace with the following:

The minimum size of floor waste gully outlets shall be as specified in Table 4.6. Where the sole function of the floor waste gully is to dispose of water spillage and wash-down water, a minimum DN 50 outlet may be used.
Clause 4.6.7.10 [as per Amendment No. 2 (2006)]

Delete Clause text [as amended by Amendment No. 2 (2006)] and replace with the following:

Individual wastepipes shall connect—

(a) to a floor waste gully riser at an angle between 45° and 88°, as close as practicable above the water seal; or

(b) to a submerged inlet floor waste gully riser at an angle of 88°.

Table 4.6

Delete Table 4.6 and replace with the following:

<table>
<thead>
<tr>
<th>Maximum number of fixture units discharging into gully trap</th>
<th>Minimum nominal size of outlet DN</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>10 (including the discharge from not more than one bath)</td>
<td>65</td>
</tr>
<tr>
<td>15</td>
<td>80</td>
</tr>
</tbody>
</table>

NOTE: A shower outlet may be used as a floor waste gully.

Clause 4.6.8.1

1 Delete the first paragraph and replace with the following:

Where a floor waste gully is located in a position that cannot receive a waste discharge, the water seal shall be maintained by one of the following means:

2 Delete Item (c) and replace with the following:

(c) A charge pipe extended from a mechanical or electronic trap priming device to the floor waste gully within the same room or compartment (see Figure 4.3(c)).

3 Delete Item (d) and replace with the following:

(d) Hose tap installed in the same room, if floor is graded to the floor waste gully.

Clause 4.6.8.2

Delete ‘NOTE’ following Item (b), and replace with the following:

NOTE: The connection of a charge pipe to a floor waste gully riser should not restrict the bore of the riser or impede access for maintenance of the gully.
Clause 4.9.1

Delete Clause and replace with the following:

4.9.1 Drains installed at grade

Drains shall be joined at grade to each other by means of a 45° junction and shall comply with the following (refer to Figure 4.6):

(a) Double 45° junctions and double sweep junctions shall not be used.
(b) Where a junction is used to make the connection of a branch drain to a main drain of the same size, the entry level of the branch drain may be on grade.
(c) Where unequal junctions are used, the invert of the branch drain shall be 10 mm higher than the soffit of the drain to which it connects.

Figure 4.6

Delete Figure 4.6 and replace with the following:

Clauses 4.9.2

Delete Clause and replace with the following:

4.9.2 Junctions installed other than on grade

Drains installed other than on grade shall be joined by means of a sweep or 45° junction if, where a sweep junction is used, the invert of the branch drain is at least 10 mm higher than the soffit of the main drain (see Figure 4.6A).
**Figure 4.6A (new)**

*Insert new Figure 4.6A after Clause 4.9.2, as follows:*

(a) 45° junction other than on grade

(b) Sweep junction other than on grade

---

**Clause 4.9.3**

*Delete Clause text and replace with the following:*

Junctions installed in a vertical plane shall not be used for connection of stacks. Sweep and 45° junctions may be installed in the vertical plane for the connection of a single discharge pipe or a drain (see Figure 4.6), provided the following criteria are met where applicable:

(a) Only a 45° junction is used for the connection of a water closet pan.

(b) The vertical riser does not exceed 2 m in height, above the invert of the graded drain.

(c) Where the length of the branch drain connected to the vertical riser exceeds 500 mm, the branch drain is independently supported.

(d) Where a vertical riser is to be extended to finished surface level and/or the distance between the invert of the main drain and the invert of the branch drain exceeds 1 m, the junction is supported in accordance with Clause 5.3.
Clause 4.9.4 (new)

Add new Clause 4.9.4, as follows:

4.9.4 Square junctions

Square junctions in drains shall be used only—

(a) at the top of a jump-up at the point of connection;
(b) at the connection of an inspection shaft to a graded drain;
(c) at the connection of a drain to a boundary trap riser;
(d) where a vent is connected to a boundary trap riser;
(e) as the inlet riser of a gully or floor waste gully;
(f) as an inspection opening; and
(g) at the top of a jump-up in a drain, in lieu of a bend and inspection opening.

Clause 4.9.5 (new)

Add new Clause 4.9.5, as follows:

4.9.5 Junctions for stacks connected to below-ground drainage

A 45° junction installed on grade and a bend at the base of the stack, as specified in Clause 6.7.3, shall be used for the connection of a stack to a below-ground drain.

Clause 4.10

Delete Clause text and replace with the following:

Jump-ups in drains shall be constructed in accordance with the following:

(a) The bend at the base of the vertical section of drain shall be supported in accordance with Clause 5.3.
(b) A bend, 45° junction, square junction or a sweep junction shall be used at the top of the vertical section of drain (see Figure 4.7).
(c) The vertical section shall be protected and supported during the installation and placement of backfilling.

Branch drains connected to jump-ups shall be independently supported where the unsupported length exceeds 500 mm.
Figure 4.7
Delete Figure, including caption, and replace with the following:

![Diagram of typical vertical jump-up from main drain to graded branches]

**FIGURE 4.7 TYPICAL VERTICAL JUMP-UP FROM MAIN DRAIN TO GRADED BRANCHES**

Clause 4.11.1, Item (c)
Add the words ‘in accordance with Clause 5.2.5’ at the end of Item (c).

Clause 5.2.4
In the second line, delete ‘authority’s’ and replace with ‘network utility operator’s’.

Clause 5.2.6
Delete Clause text and replace with the following:
Where the bottom of the trench is adjacent to or below the footing and walls of any adjoining building or structure, the advice of a suitably qualified expert shall be obtained.
If shoring and underpinning of building is necessary, it shall be carried out under the direction of a suitably qualified expert.
NOTE: For additional information, see Clause 3.8.2.
Clause 5.3

1 Delete Item (c) and replace with the following:
   (c) under all bends greater than DN 65 forming risers from the main drain;

2 Add new Items (e) and (f) as follows:
   (e) for sweep junctions, beneath the junction to a minimum thickness of 100 mm and continued up vertically to the centre of the junction fitting; and,
   (f) for 45° junctions, beneath the junction to a minimum thickness of 100 mm and continued up vertically to the underside of the bend fitted to the junction fitting.

Clause 5.4.1

1 Delete Item (a) and replace with the following:
   (a) In stable soil, drains shall be laid on a bedding material in accordance with Clause 5.4.2, or shall be directly supported on the undisturbed base of the trench, provided the base of the trench is free from any rocks or tree roots.

2 Item (b), delete the word ‘loam’.

Clause 5.4.2

Delete Clause text and replace with the following:

Filling materials used for bedding of drains (see Figure 5.1) shall be one of the following:

(a) Crushed rock, gravel screenings or similar recycled materials of nominal size of 7–10 mm.

(b) Cement mortar containing 1 part of Portland cement to 4 parts of sand by volume, thoroughly mixed with clean water to a workable consistency.

(c) Cement mortar bedding where the base of the trench is rock or shale and, where the grade is greater than 20% (1 in 5), the cement mortar shall be—
   (i) of a minimum depth of 50 mm measured below the barrel of the pipe;
   (ii) not less than 75 mm wide;
   (iii) not closer than 20 mm to flexible joints; and
   (iv) have pies supported at not greater than 1500 mm from the centres, prior to placing the mortar bedding.

(d) Free-running sand capable of passing through a 2 mm mesh sieve, and does not contain clay, organic or any other deleterious materials.

NOTES:
1 Cast iron and ductile iron pipes may be unsupported for up to 600 mm either side of each pipe joint.
2 For installation of PVC-U pipe systems see AS/NZS 2032. For installation of polyethylene pipe systems, see AS/NZS 2033.
Clause 5.5
Delete Clause and replace with the following:

5.5 INSTALLATION OF BACKFILL MATERIALS

5.5.1 General
Backfill materials shall be compacted to restore the trench as near as practicable to the normal surrounding ground surface level and reduce the likelihood of subsidence.

NOTE: For minimum cover, see Clause 3.7.

5.5.2 Builder’s waste
Builder’s waste (e.g., bricks, concrete, steel, wood and similar waste) shall not be used as backfill material.

5.5.3 Excavated material
Excavated material from the trench may be suitable for final backfill provided it is free from rock, hard matter and organic material, and broken up so that it contains no soil lumps larger that 75 mm, which would prevent adequate compaction.

Clause 5.6
Delete Clause text and replace with the following:

Prior to the commencement of work, ground conditions shall be assessed by a suitably qualified expert. Where ground conditions may affect the performance of any plumbing or drainage installation, the method to protect the installation shall be determined by a suitably qualified expert. Soil classification reports shall be in accordance with AS 2870.

C5.6 For proclaimed mine subsidence or landslip districts, the appropriate authority should be referred to for advice of subsidence or landslip design parameters for proposed drainage systems.

Table 6.1, Note 4
Insert ‘(all parts)’ after AS 1428.

Clause 6.4.4.1, (Item (b))
Delete Item (b) and replace with the following:

(b) Sinks (other than pot, laboratory or utility sinks).

Clause 6.5.2
Delete Clause and replace with the following:

Clause 6.5.2 Connection methods

6.5.2.1 General
Connection of graded pipes to each other or connection of fixture discharge pipes to graded pipes shall comply with the following:

(a) Graded discharge pipes of different sizes shall be connected so that the soffits of both pipes are in common alignment.

(b) The invert level of a trap or floor waste gully weir shall be a minimum of 10 mm higher than the soffit of the graded discharge pipe to which it connects (see Figure 6.2).
6.5.2.2 **Opposed discharges**

Opposed discharge pipes shall be connected to comply with Clause 6.5.2.1(b), using—

(a) two separate junction fittings; or

(b) junction branches fabricated so that the opposed junction entries do not overlap.

6.5.2.3 **Junction types in graded pipes**

Junctions (whether equal or unequal) shall be either 45° or sweep type.

Double 45° junctions or double sweep junctions shall not be used to make connections on grade.

6.5.2.4 **Junctions installed at grade**

Discharge pipes shall be joined at grade to each other by means of a 45° junction and shall comply with the following:

(a) Where a junction is used to make the connection of a branch drain to a main drain of the same size, the entry level of the branch drain may be on grade.

(b) Where unequal size junctions are used, the invert of the branch pipe shall be 10 mm higher than the soffit of the pipe to which it connects.

6.5.2.5 **Junctions installed other than at grade**

Pipes installed other than at grade shall be joined by means of a sweep or 45° junction provided, where a sweep junction is used, the invert of the branch pipe is at least 10 mm higher than the soffit of the main pipe.

6.5.2.6 **Junctions installed in a vertical plane**

Sweep and 45° junctions may be installed in the vertical plane for the connection of a single discharge pipe, provided only a 45° junction is used for the connection of a water closet pan.

6.5.2.7 **Junctions for stacks connected to a graded pipe**

Junctions installed on grade for the connection of a stack to a graded pipe shall be in accordance with Clause 6.7.3.

---

**Clause 6.6.1 [as per Amendment No. 1 (2005)]**

*Delete* Clause text [as amended by Amendment No. 1 (2005)] and *replace* with the following:

Any of the following types of junctions may be used to connect fixture, branch or common discharge pipes to a stack, the following apply:

(a) 45° junctions.

(b) Sweep junctions.

(c) Aerator junctions.

(d) Ball junctions.

(e) Square junctions.

No fixture shall be connected to the branch or common discharge pipe within 500 mm in length from the stack if the entry is at grade.
Clause 6.6.2

Delete Clause and replace with the following:

6.6.2 Restrictions for square and ball junctions

Where any fixture trap is connected to a ball junction, the weir of the fixture trap shall be at the same height or above the top of the branch junction fitting.

Where a square or ball junction is used and any discharge pipe is less than 500 mm in length from the stack, one of the following shall apply:

(a) A self-sealing device shall be fitted to the fixture.

(b) An S-trap shall be fitted to the fixture and a vertical dropper provided in the discharge pipe between the fixture and the stack junction.

(c) A P-trap shall be fitted to the fixture, and the discharge pipe graded at not less than 6.65% (1 in 15).

Clause 6.6.3

Delete Clause (including subclauses).

Clause 6.6.4

Delete Clause.

Clause 6.6.5.1 [as per Amendment No. 1 (2005)]

Delete Clause text [as amended by Amendment No. 1 (2005)] and replace with the following:

Opposed connections at ball junctions or aerator junction fittings may be used only where the opposing pipes are connected to equal numbers of the same type of fixtures.

Opposed connections, other than at ball type junctions or aerator junction fittings, shall only be made using double 45° junctions or double sweep junctions.
Figure 6.3

Delete Figure and Caption and *replace* with the following:

![Connections to Stacks Diagram](image)

**FIGURE 6.3 CONNECTIONS TO STACKS**
Figure 6.4

Delete Figure 6.4 and replace with the following:

Stack two floor levels or less

Stack three floor levels or more

See Clause 6.7.2

500 mm

500 mm

No connections permitted within hatched distances (see Clause 6.7.1(b))

2.5 m

1 m

Flow

No connections permitted within hatched distances (see Clause 6.7.1(b))
# Clause 6.7.3

Delete Clause and replace with the following:

> **6.7.3 Connection of stacks to graded pipes or drains above ground**

Connection of stacks to graded pipes or drains above the ground shall be made by—

(a) a 45° junction installed on grade and a bend at the base of the stack in accordance with Clause 6.7.4; or

(b) a 45° junction installed in the vertical plane with an extended branch so that the vertical projection of the stack, on the graded pipe or drain above the ground, is wholly outside the junction area, as shown in Figure 6.5.

---

**Figure 6.5**

Delete Figure and replace with the following:

![Diagram of stack connection](image-url)
Clause 6.7.4 (new)

Add new Clause 6.7.4 after Figure 6.5 as follows:

6.7.4 Bends at the base of stacks

Bends at the base of stacks shall be not smaller in size than the graded pipe or drain to which they connect. They shall—

(a) have a centre-line radius not less than that stated in Table 6.5;
(b) consist of two 45° bends separated by a straight pipe of length not less than twice the bore of the pipe; or
(c) consist of an 88° bend where a stack extends through no more than two floor levels.

Where a stack is smaller than the graded pipe, a taper fitting shall be installed in the vertical stack, as shown in Figure 6.5.

Table 6.5

Delete title of Table 6.5 and replace with the following:

MINIMUM RADIUS FOR BENDS AT THE BASE OF STACKS

Clause 6.8.2

Insert ‘(1 in 80)’ after ‘1.25%’.

Figure 6.6

Delete Figure and replace with the following:
Clause 6.9.2, Item (b) [as per Amendment No. 2 (2006)]

Delete Item (b) [as amended by Amendment No. 2 (2006)] and replace with the following:

(b) Where the sanitary drains from three or more buildings on an allotment discharge to the sewerage system, the sanitary drainage system of each building shall have at least one open upstream vent connected to its sanitary drain.

Table 6.6

Delete title of Table 6.6 and replace with the following:

| TABLE 6.6 | MINIMUM DETERMINED AIRFLOW CAPACITY OF AIR ADMITTANCE VALVES WHEN USED AS A TRAP VENT, GROUP VENT OR BRANCH DRAIN VENT |

Section 6A (new)

Insert new Section 6A after Section 6, as follows:

SECTION 6A GREYWATER PLUMBING AND DRAINAGE SYSTEMS

6A.1 SCOPE OF SECTION

This Section specifies requirements for the installation of greywater sanitary plumbing and drainage from the respective plumbing fixtures to greywater treatment or diversion devices and overflow therefrom where directed to the drainage system.

Greywater systems may include the following:

(a) Direct diversion devices—

(i) diversion valve installed in the sanitary plumbing system; or

(ii) in-ground diversion vessels.

(b) Treatment systems.

Where a greywater treatment system is being used, the greywater shall be treated to an acceptable level as determined by the authority having jurisdiction.

NOTES:

1 The respective authority will determine the quality levels for treated greywater that is to be used for acceptable internal and external use.

2 Discharge from greywater treatment systems may be considered as a trade waste discharge and may require approval by the network utility operator for connection to the sewer system.
6A.2 GENERAL
Greywater plumbing and drainage systems shall be designed in such a manner so that—
(a) sewage surcharge cannot enter in-ground greywater diversion vessels or greywater treatment systems; and
(b) rainwater, stormwater and surface water cannot enter a network utility operator’s sewerage system or an on-site wastewater disposal system such as a septic tank or common effluent system.

Before commencing work on a greywater drainage system, approval shall be obtained from the authority/authorities having jurisdiction.

6A.2 There are a number of authorities that should be consulted where greywater use is being considered. These authorities include the following:
(a) The network utility operator(s) responsible for drinking water supply and sewerage or both.
(b) The environmental protection authority.
(c) The respective health authority.
(d) Local councils.

Storage of untreated greywater for longer than 24 h is not recommended and may not be permitted under health requirements.

6A.3 MATERIAL AND PRODUCTS
All pipes and fittings from a sanitary fixture to a greywater diversion vessel shall comply with Section 2.

6A.4 INSTALLATION REQUIREMENTS
6A.4.1 Installation
Sanitary plumbing and drainage piping from a sanitary fixture to a greywater system shall comply with the following:
(a) In an area serviced by a network utility operator’s wastewater system, a permanent connection to the wastewater system shall be maintained to enable the greywater to be redirected into the sanitary drain.
(b) Unless otherwise permitted by the regulatory authority, greywater to be returned to the network utility operator’s wastewater system shall be conveyed via a disconnector gully.
(c) All access openings to any vessel shall be securely sealed and vermin-proofed.
(d) Greywater sanitary plumbing and drainage piping shall be installed directly to a treatment/diversion vessel and independently of other systems.
(e) Drainage from below-ground greywater diversion devices that gravitate to the sewer shall be protected from sewage surcharge by the installation of a reflux valve.
(f) All pipework greater than DN 80 connected to a diversion device or treatment system shall be clearly marked ‘GREYWATER’ at intervals not exceeding 1 m in accordance with AS 1345.

NOTE: A direct diversion device installed above the level of the overflow relief gully does not require protection from sewage surcharge.
Clause 7.5.1.1, Item (b)

Delete Item (b) and replace with the following:

(b) In the case of fixtures other than basins and bidets, the vent shall be connected between 75 mm and 1500 mm from the crown weir of the fixture trap, provided that, where the S-trap is fitted or a bend is fitted downstream of the P-trap, the vent connection on the vertical discharge pipe is at least 300 mm from any bend at the base of the vertical section.

Clause 7.5.3.4, Item (b)

Delete ‘Clause 6.7.4’ and replace with ‘Clause 6.8.4’.

Clause 7.5.7.4

Delete Clause text and replace with the following:

Group vents shall terminate in the same manner as branch vents (see Clause 7.5.2.2) or with an air admittance valve (AAV) in accordance with Clause 6.9.
Figure 7.10

Delete Figure [as per Amendment No. 1 (2005)] and replace with the following:

Clause 8.4.1
Add the following new Item (k) after Item (j):

‘(k) Two bar sinks.’

Clause 8.4.2, Item (a)
1 Delete ‘or’ at the end of Item (vii).
2 Delete full stop at the end of Item (viii) and replace with ‘; or’.
3 Insert new Item (ix) under Item (viii) as follows:

‘(ix) two bar sinks.’

Clause 8.5.6
Delete Clause text and replace with the following:

Two fixture discharge pipes, including discharge pipes from floor waste gullies, receiving the discharge from waste fixtures, may connect to the stack within a distance of 1 m by means of a 45° junction, provided (see Figure 8.4)—

(a) the angle between the two fixture discharge pipes is not greater than 45°;
(b) the outlet of the junction is one size larger than the largest fixture pipe except in the case of a floor waste gully that does not receive the discharge from a fixture; and
(c) the section of pipe downstream of the 45° junction is included as part of the permitted maximum length of the fixture discharge pipe.

Figure 8.4
Delete the word ‘OBLIQUE’ from Figure caption.

Clause 8.5.9
Delete ‘Clause 6.3’ and replace with ‘Clause 6.4’.

Clause 8.6.3
Delete ‘Clause 7.7’ and replace with ‘Clause 7.5.3’.

Clause 8.8.2, Item (c)(vi)
Delete Item (c)(vi).

Clause 8.8.3, Item (b)(vi)
Delete Item (b)(vi).
Figure 8.9

Delete Figure and replace with the following:

Topmost section can be nominally horizontal

Maximum 3 floors in height and 30 fixture units
Figure 8.11
*Delete Figure and replace with the following:

![Diagram of plumbing system with labels]

- Vent pipe DN 50
- Connection of fixture discharge pipe to branch pipe
- Restricted zones (see Clause 7.6.2.5)
- Size of branch pipe can vary to a minimum of DN 50
- 2500 min.
- 600 min.
- 450 min. Restricted zones (see Clause 7.6.2.5)

Figure 8.18
*Delete Figure and replace with the following:

![Diagram of plumbing system with labels]

- Stack not less than DN 100
- Vent pipe DN 40
- Unvented branch (900 min.)
- WC only and vented (600 min.)
- Offset (gradient) less than 45°
- 450 min. restricted zone (see Clause 7.6.2.5)
- 900 min.
- To sewer
- 2500 min.
- 600 min.
- 600 min.
- Restricted zone (see Clause 7.6.2.5)
Clause 9.2.3 (new)

Add new Clause 9.2.3 as follows:

9.2.3  Holes in framework

Where holes are formed in the framework to accommodate pipework, they shall be sized to allow free longitudinal movement of the pipework without affecting the structural integrity of the framework.

Clause 9.5.1

Delete Clause text and replace with the following:

This Clause applies to plumbing systems, including elevated pipework, using drainage principles.

NOTE: For sanitary drains, see Clause 4.7.

Clause 9.5.2

Delete Clause and replace with the following:

9.5.2  Location of testing and inspection openings

All common discharge pipes and stacks shall be provided with openings for inspection and testing in the following locations:

(a)  In any common discharge pipe where necessary for inspection and testing.
(b)  At the base of every stack.
(c)  At any level of a stack where necessary for inspection and testing.
(d)  At intervals of no greater than 30 m in every common discharge pipe.
(e)  At every junction fitting that connects a common discharge pipe to a stack, or in the upstream section of the common discharge pipe.

NOTES:

1  Inspection and testing openings may be raised to finished surface level and fitted with an airtight removable cap.
2  Where testing or inspection openings are located within a tenancy occupied by another party, consideration should be given to raising the inspection or testing opening into the tenancy that it serves.

Clause 9.5.3

Delete Clause and replace with the following:

9.5.3  Size of testing and inspection of openings

Testing and inspection openings shall have a minimum clear diameter in accordance with Table 9.1A.
Table 9.1A (new)

Add the following new Table 9.1A after Clause 9.5.3:

<table>
<thead>
<tr>
<th>Nominal size DN</th>
<th>Minimum clear diameter mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>24</td>
</tr>
<tr>
<td>50</td>
<td>29</td>
</tr>
<tr>
<td>65</td>
<td>60</td>
</tr>
<tr>
<td>80</td>
<td>75</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>175</td>
<td>150</td>
</tr>
<tr>
<td>225</td>
<td>150</td>
</tr>
<tr>
<td>300</td>
<td>150</td>
</tr>
</tbody>
</table>

Clause 9.5.4 (new)

Add new Clause 9.5.4 after new Table 9.1A, as follows:

9.5.4 Access to inspection openings

Every required inspection opening shall be accessible.

Clause 9.6.3.1

In the second line delete ‘Clauses 9.6.2.2, 9.6.2.3 and 9.6.2.4’ and replace with ‘Clauses 9.6.3.2, 9.6.3.3 and 9.6.3.4’.

Clause 9.6.3.2, Item (a)(ii)

In the second line, delete ‘Clause 9.6.3’ and replace with ‘Clause 9.6.4’.

Clause 9.7

Replace ‘AS 2032’ with ‘AS/NZS 2032’.

Clause 9.12.2

Delete Clause text and replace with the following:

The maximum length and size of any unvented graded pipe, branch or fixture discharge pipe shall be in accordance with Clause 3.10 and Table 3.6.
Clause 9.12.3

Delete Clause text and replace with the following:

The requirements of this Section shall apply to the first four floor levels only above either the invert level of the connection point to the boundary trap riser or inspection shaft, and the uppermost floor only where connected into a discharge stack. Branches serving the uppermost floor, which connect to a discharge stack, are permitted to use drainage principles. Branches serving the floors below the uppermost floor shall comply with a nominated stack design in accordance with Clause 9.12.4 (b).

Clause 9.12.4

Delete Clause text and replace with the following:

Above-ground (elevated) pipework, materials, methods of support and fixing shall be in accordance with the relevant requirements of this Standard (see Figure 9.2) and the following:

(a) No graded discharge pipe or branch, except a discharge stack, shall connect to any vertical section of pipework within the first four floor levels.

(b) Any discharge stack system in excess of the maximum of four floor levels specified in Clause 9.12.3 shall be installed as a stack in accordance with the relevant requirements of Section 6, Section 7, Section 8 or Section 9, as applicable.

(c) The loading in fixture units shall not exceed the maximum permitted as specified in Tables 3.1, 3.6 and 7.2, as applicable.

(d) The connection of any discharge pipe or branch to the elevated pipework shall be in accordance with the relevant requirements of Clauses 6.6, 6.7, 7.6 and 8.9, and Section 9A.

(e) The total length of an unvented branch pipe, including the length of the fixture discharge pipe that connects to the main section of graded elevated pipework, shall be in accordance with Clause 3.10.3.

NOTES:
1. The discharge stack may roll over on the top floor or carry on as a stack vent.
2. A maximum loading of 30 fixture units, including not more than two WC pans or two slop hoppers, are permitted to discharge into any branch on the top floor of a discharge stack without further ventilation.
Figure 9.2

Delete Figure and replace with the following:

Connections using drainage principles and sized in accordance with Clause 3.11 and Table 3.6

Sanitary drainage fixtures are permitted to be connected between the point of stack connection and the top floor branch as plumbing connections (see Clause 9.12.4(b))

Restricted zone at base of stack (see Clause 5.7.2)

Unvented connections using drainage principles to graded sections of pipework only and sized in accordance with Clause 3.11 and Table 3.6
**Table 9.2**

*Delete Table and replace with the following:*

<table>
<thead>
<tr>
<th>To—Material 2</th>
<th>Cast and ductile iron</th>
<th>Copper and copper alloy</th>
<th>Galvanized steel</th>
<th>PP</th>
<th>PVC-U</th>
<th>PE</th>
<th>ABS/ASA</th>
<th>VC</th>
<th>FRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast and ductile iron</td>
<td>BG RR</td>
<td>BG RR* SB/ER</td>
<td>BG RR</td>
<td>BG RR</td>
<td>BG RR SC/ER BC</td>
<td>BG RR SC/ER BC</td>
<td>RR BG RR/ER RR CM BC</td>
<td>RR BG BC</td>
<td></td>
</tr>
<tr>
<td>Copper and copper alloy</td>
<td>BG RR* ER SB/ER</td>
<td>BG TH/SB ER/SB</td>
<td>TH/SB RR</td>
<td>SC/TH/SB SC/ER/SB RR</td>
<td>RR/SB TH SC/TH/SB SC/ER/SB RR</td>
<td>RR/SB BG RR/ER CM BC</td>
<td>RR BC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galvanized steel</td>
<td>BG RR* ER SB/TH ER</td>
<td>TH BG</td>
<td>TH</td>
<td>SC/TH SC/ER</td>
<td>TH</td>
<td>SC/TH SC/ER</td>
<td>CM RR RR ER</td>
<td>RR BC</td>
<td></td>
</tr>
<tr>
<td>FRC</td>
<td>RR BC</td>
<td>RR BC</td>
<td>RR</td>
<td>RR BC ER</td>
<td>RR BC ER</td>
<td>RR BC ER</td>
<td>RR BC ER</td>
<td>RR BC</td>
<td></td>
</tr>
</tbody>
</table>

*Applies to vent connections only.*

**LEGEND:**

- **BG** = bolted gland
- **RR** = rubber ring
- **ER** = epoxy resin
- **CM** = cement mortar
- **SB** = silver brazed
- **SC** = solvent cement
- **TH** = threaded
- **BC** = band clamped sleeve
- **EF** = electrofusion

**NOTE:** Where more than one joint type is shown separated by one or more slashes, the joint between the two different materials requires an adaptor. The order of the joints is always shown from (Material 1) to (Material 2) as indicated in the Table headings.
Clause 9.14.7

Delete Clause and replace with the following:

Solvent cement and priming fluid used for jointing plastic pipes and fittings shall comply with Clause 2.6.5.1 as appropriate.

Clause 9A.1.2 [as per Amendment No. 1 (2005)]

Delete text of Clause 9A.1.2 [as per Amendment No. 1 (2005)] and replace with the following:

Where the system uses an aerator junction fitting (a proprietary junction fitting) in the stack at each floor level for connection of graded discharge pipes, common discharge pipes or branch drains from sanitary fixtures, a de-aerator is required at the base of the stack.

Airflow requirements of the system are provided through the stack vent. Discharge pipes, common discharge pipes and branch drains that exceed the maximum allowable length or fixture unit loading shall be vented.

Clause 9A.2 [as per Amendment No. 1 (2005)]

Delete first paragraph [as per Amendment No. 1 (2005)] and replace with the following:

The stack shall be sized in accordance with Table 6.1, Table 7.1 and Table 7.2, and Clause 7.4, Items (a), (b), (c) and (e).
Delete Figure 9A.4 [as per Amendment No. 1 (2005)] and replace with the following:

See Clause 7.6.2

600 mm

450 mm

Above-ground (elevated) drainage principles (see Clause 9.12)

2.5 m (see Clause 7.6.2)

500 mm (see Clause 9A.8)

WC

FW

BS

See Clause 9A.8

See Clause 9A.8

5 m max. (see Clause 9A.8)

Legend:

restricted zone

FIGURE 9A.4 GRADED STACK OFFSET WITH PRESSURE RELIEF BY-PASS
Clause 9A.6 [as per Amendment No. 1 (2005)]

Delete text of Clause 9A.6 [as per Amendment No. 1 (2005)] and replace with the following:

Any unvented discharge pipe or unvented common discharge pipe shall not exceed 10 m in length, and shall not include a vertical drop, between the crown of the trap and the invert of the junction, exceeding—

(a) 2 m from water closet pans with DN 80 discharge pipes;
(b) 1.5 m for basins and bidets; and
(c) 2.5 m for all other fixtures.

The length of a graded discharge pipe shall be in accordance with Appendix D.

Clause 9A.7 [as per Amendment No. 1 (2005)]

Delete text of Clause 9A.7 [as per Amendment No. 1 (2005)] and replace with the following:

The size of a graded discharge pipe, common discharge pipe or branch drain shall be in accordance with Table 3.6 and Appendix D.

Clause 9A.8 [as per Amendment No. 1 (2005)]

1. In the first paragraph, replace ‘(see Figure 9A.4)’ with ‘(see Figure 9A.6)’.

2. Add the following paragraph at the end of the Clause:

When de-aerators are used for graded stack offsets, the pressure relief by-pass pipe shall run at least 0.5 m from the centre-line of the stack to the centre of the pressure relief by-pass inlet junction (see Figure 9A.4). No connections shall be made into by-pass pipe.

Figure 9A.6 [as per Amendment No. 1 (2005)]

Delete Figure 9A.6 and replace with the following:

FIGURE 9A.6 DE-AERATOR WITH PRESSURE RELIEF BY-PASS PIPE AT THE BASE OF THE STACK
Clause 10.5.1

Delete Clause text and replace with the following:

Wet wells shall be fit for purpose and installed in an accessible location.

Clause 10.5.4

Delete Clause text and replace with the following:

The base shall be constructed or finished with a self-cleansing grade towards the pump inlet.

Clause 10.6.1

Delete Items (b) and (c), and replace with the following:

(b) Each pump shall be fitted with an isolating valve and check valve on the delivery side.
(c) Pumps shall be installed with connections to permit removal and replacement of the pump.

Clause 10.6.2

Delete Clause text and replace with the following:

The invert of the gravity discharge pipe to a wet well shall be located at least 100 mm above the highest working level and terminate with a square junction.

Clause 10.6.3

Add the following ‘Note’ after Clause 10.6.3 as follows:

NOTE: Manufactured wet wells that are watermarked may be approved with a smaller vent size.

Clause 10.7

Delete Clause text and replace with the following:

The pump discharge pressure piping shall comply with the relevant sections of AS/NZS 3500.1 and this Standard. The outlet pipe shall discharge to one of the following locations:

(a) An inspection chamber.
(b) A boundary trap shaft.
(c) A stack below the lowest fixture connection on any floor.
(d) A drain or combined discharge pipe, provided the connection is at least 2.5 m from any other connection.
(e) Downstream of a reflux valve or at least 2.5 m upstream of a reflux valve.
(f) A minimum of 1 m downstream of a boundary trap.
(g) Direct to the network utility operator’s sewer where approved by the network utility operator.
Clause 10.8.1
Delete Clause text and replace with the following:
Pumping shall only be permitted where gravity connection from a waste fixture is not possible. The pumping apparatus shall be positioned in the same room adjacent to the waste fixture.

Clause 10.8.2
Delete the reference to ‘Clause 10.5.3’.

Clause 10.8.3
Delete Clause text and replace with the following:
Valves shall be provided as follows:
(a) Where the pump is located inside the holding tank, a non-return valve and isolating valve shall be located on the outlet side of the pump.
(b) Where the pump is located outside of the holding tank, an isolating valve shall be located on the inlet and outlet of the pump and a non-return valve shall be located on the downstream of the outlet isolating valve.

Clause 10.8.4
Delete Clause text and replace with the following:
The invert of each waste inlet shall be located at least 100 mm above the highest working level of the holding tank.

Clause 10.8.5
Delete Clause text and replace with the following:
The pump discharge pipes shall be at least DN 25 and not less than the pump outlet size.

Clause 10.8.7
Delete Clause and replace with the following:

10.8.7 Pump discharge pipe
The pump discharge pipe from waste fixtures, or swimming pools, shall be connected in accordance with Clause 10.7, or connected to a gully riser as shown in Figure 10.1 or Figure 10.2.
**Figure 10.1**

*Delete Figure and replace with the following:*

- Concrete surround (see Clause 4.6.2(c)(ii))
- Finished surface level
- Gully grate (see Clause 4.6.2(b))
- 75mm
- Tapered joint to suit application
- Pumped waste discharge
- Concrete support for gully (see Clause 4.6.2(c)(i))

**Clause 10.9**

*Delete Clause.*

**Figure 10.2**

*Delete Figure and replace with the following:*

- Concrete surround (see Clause 4.6.2(c)(ii))
- Invert level
- Waste may discharge into branch
- 150 mm
- Grate (see Clause 4.6.2(b))
- 75 mm min.
- Finished surface level
- Pumped discharge from swimming pool
- Concrete support for gully (see Clause 4.6.2(c)(i))
Clause 10.10

Delete Clause and replace with the following:

10.10 SMALL BORE MACERATOR PUMPS

Small bore macerator pumps shall discharge in accordance with Clause 10.7.

A vent pipe to a macerator pump shall terminate in accordance with Clause 6.8.4 or interconnect with any other vents other than those described in Clause 6.8.3.

NOTE: Small bore macerator pumps may not operate if air admittance valves are the sole means of venting the unit.

Section 11

Delete text of Section 11 [including text as amended by Amendment No. 1 (2005)] and replace with the following:

SECTION 11 FIXTURES AND APPLIANCES

11.1 SCOPE OF SECTION

This Section specifies requirements for the installation of sanitary fixtures and appliances, and their connection to the sanitary plumbing or sanitary drainage system.

NOTE: The requirements for the maximum lengths of discharge pipes without venting are given in Appendix D.

11.2 INSTALLATION OF SANITARY FIXTURES FOR PEOPLE WITH DISABILITY

The installation of sanitary fixtures for people with disabilities shall comply with AS 1428.1. In New Zealand, the requirements of the NZ Building Code shall apply.

11.3 GENERAL INSTALLATION REQUIREMENTS

11.3.1 Installation of fixtures

Fixtures and appliances shall be secured in position, independent of support from their traps, waste and discharge pipes or water supply connections. They shall be installed in a manner that facilitates disconnection.

11.3.2 Location of fixture traps or self-sealing devices

Fixture traps or self-sealing devices shall be installed downstream of the fixture outlets in accordance with Clause 6.4.3.

11.3.3 Untrapped fixtures

Untrapped fixtures that are permitted to discharge through a floor waste gully shall be connected in accordance with Table 4.4.

11.3.4 Connection of combination fixtures in pairs

Where a combination of waste fixtures is connected in pairs to a single fixture trap, the arrangement shall be in accordance with Clause 6.4.4.

11.3.5 Connection of soil fixtures

Soil fixtures shall not discharge through floor waste, overflow relief or disconnector gullies.
11.3.6 Fixture grates
Excluding water closet pans, slop hoppers, bedpan washers, bedpan sterilizers, tundishes, soil dump points and sanitary napkin disposal units, the outlet of each fixture shall be provided with a grate.

Where the fixture trap is not accessible, the grate shall be removable.

11.3.7 Sanitary flushing
The requirements for the sanitary flushing of fixtures and appliances shall be in accordance with AS/NZS 3500.1.

11.3.8 Fixture discharge pipes
Fixture and appliance discharge pipes shall be installed in accordance with the following:
(a) Clause 3.10 for direct to drain connections.
(b) Clause 3.11 and Clause 3.12 for unvented drains discharging to gullies.
(c) Clause 4.6.7 for floor waste gully connections.
(d) Table 4.1 for disconnector gully connections.
(e) Clause 6.5 for graded discharge pipe connections.
(f) Clause 7.3 for fully vented and fully vented modified stack connections.
(g) Clause 8.5 for single stack and single stack modified stack connections.
(h) Clause 9.12 for above-ground pipework and connection of fixtures using drainage principles.
(i) Section 9A for reduced velocity aerator stack systems.
(j) Appendix D.

11.4 PLANT ROOMS
Discharges from plant rooms shall drain to a tundish, trapped sump or floor waste gully. Fixture unit ratings shall be determined from Table 6.2.

11.5 PRESSURIZED CHAMBERS
Where a floor waste gully is located in a pressurized chamber, the trap shall be in accordance with Clause 6.4.2.

11.6 AUTOPSY TABLES
Autopsy tables shall be connected to sanitary drains in accordance with the following:
(a) Each autopsy table shall drain through an untrapped wastepipe not smaller than DN 50 and a maximum length of 1.2 m to a flushing floor waste gully with an outlet not smaller than DN 65.
(b) The water supply to the flushing floor waste gully shall be from a flush valve, cistern or break tank.

11.7 BAIN-MARIES AND BOILING WATER UNITS
Bain-maries and boiling water units shall drain to a tundish installed in accordance with Clause 11.21.
11.8 BASINS
Basins shall be fitted with a DN 40 (or DN 32, New Zealand only) trap and a wastepipe not smaller than DN 40 or connected as fixture pairs in accordance with Clause 6.4.4.

11.9 BATHS
Baths shall be connected by—
(a) an untrapped wastepipe not smaller than DN 40 to a floor waste gully in accordance with Table 4.4 or;
(b) a trap and wastepipe not smaller than DN 40.
Where a bath trap is not accessible, the bath shall discharge untrapped to a floor waste gully (FWG) in accordance with Table 4.4 and Appendix D.

11.10 BEDPAN WASHERS AND SANITIZERS
Bedpan washers and sanitizers shall be fitted with traps and discharge pipes not smaller than DN 80.

11.11 BIDETS
Bidets and bidettes shall be connected by—
(a) an untrapped wastepipe not smaller than DN 40 (or DN 32, New Zealand only) to a floor waste gully; or
(b) a trap and wastepipe not smaller than DN 40 (or DN 32, New Zealand only).

11.12 DENTAL UNITS
11.12.1 Single
A single dental unit shall discharge through a sealed trap not smaller than DN 40.

11.12.2 Multiple
Multiple dental units draining to a common point shall discharge through a sealed trap not smaller than DN 50.

11.13 DRINKING FOUNTAINS
Drinking fountains shall be fitted with a DN 40 (or DN 25, New Zealand only) trap and a wastepipe not smaller than DN 40 (or DN 32 New Zealand only).

11.14 FOOD WASTE DISPOSAL UNITS (DOMESTIC TYPE)
The outlet of a waste disposal unit may be connected directly to the trap of an adjoining kitchen sink [see Figure 11.1 (c)].

11.15 REFRIGERATED, DEEP-FREEZE CABINETS, COMMERCIAL COFFEE-MAKING MACHINES AND ICE-MAKING MACHINES
Outlet pipes from refrigerated and deep-freeze cabinets, commercial coffee-making machines and ice-making machines shall be connected to a tundish installed in accordance with Clause 11.21 or discharge above the inlet to a self-sealing device.

11.16 MACERATING SANITARY NAPKIN DISPOSAL UNITS
Macerating sanitary napkin disposal units shall not discharge to a floor waste, overflow relief or disconnecter gully.
11.17 SHOWERS

11.17.1 Individual showers

An individual shower shall be fitted with a minimum DN 80 grate or channel grate, and shall be connected by—

(a) an untrapped wastepipe not smaller than DN 40 to a floor waste gully;
(b) a trap and wastepipe not smaller than DN 40.

NOTE: Prefabrication shower bases are to be supported in accordance with the manufacturer’s instructions.

11.17.2 Shower groups

Shower groups may drain individually, as fixture pairs in accordance with Clause 6.4.4 or to a common channel.

11.17.3 Common channels

Common channels shall—

(a) be graded to the outlet; and
(b) discharge through a removable grate, trap and discharge pipe as given in Table 11.1.

<table>
<thead>
<tr>
<th>Numbers of showers</th>
<th>Sizes of grate DN</th>
<th>Size of trap and discharge pipe DN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>2 or 3</td>
<td>80</td>
<td>50</td>
</tr>
<tr>
<td>4 to 6</td>
<td>100</td>
<td>65</td>
</tr>
</tbody>
</table>

11.18 SINKS

11.18.1 Kitchen sinks

Kitchen sinks shall be connected by using a fixture trap and wastepipe not smaller than DN 50 or DN 40 (New Zealand only) or as fixture pairs in accordance with Clause 6.4.4 directly to a stack, sanitary drain or overflow relief or disconnector gully.

Triple bowl domestic kitchen sinks shall be connected—

(a) as three single bowl sinks;
(b) as a fixture pair and one single bowl sink; or
(c) through a single fixture trap, provided the length of discharge pipe between the sink outlets and the fixture trap seal is not greater than 1.2 m.

11.18.2 Bar sinks

Bar sinks (domestic) shall be connected by—

(a) an untrapped wastepipe not smaller than DN 40 to a floor waste gully; or
(b) a trap and wastepipe not smaller than DN 40.

Bar sinks (commercial) shall be connected by—

(i) an untrapped wastepipe not smaller than DN 50 to a floor waste gully; or
(ii) a trap and wastepipe not smaller than DN 50.
11.18.3 Cleaners’ sinks

Cleaners’ sinks shall be connected to drains by—
(a) an untrapped wastepipe not smaller than DN 50 to a floor waste gully; or
(b) a trap and wastepipe not smaller than DN 50.

11.18.4 Pot, utility and laboratory sinks

Pot, utility or laboratory sinks shall be connected by using a trap and wastepipe not smaller than DN 50.

Pot, utility or laboratory sinks shall not be connected as fixture pairs.

NOTE: Trade waste discharge from pot, utility or laboratory sinks may require pre-treatment as determined by the network utility operator.

11.19 SLOP HOPPERS

11.19.1 Connection

Slop hoppers shall be connected directly to soil stacks or drains with a discharge pipe not smaller than DN 100.

11.19.2 Installation

Slop hoppers shall be installed and secured—
(a) on bedding not thicker than 20 mm; or
(b) in accordance with manufacturer’s instructions, provided the installation procedure is not in conflict with this Standard.

11.20 INSTRUMENT STERILIZERS AND AUTOCLAVES

Instrument sterilizers and autoclaves shall discharge over a tundish installed in accordance with Clause 11.21.

11.21 CONNECTION OF TUNDISHES

Tundishes may be connected—
(a) to a wastepipe not smaller than DN 25 in accordance with Clause 4.6.7.8;
(b) to a trapped wastepipe not smaller than DN 40 in accordance with Appendix D; or
(c) to a fixture trap.

When the tundish and discharge pipe is connected to a fixture trap—
(i) the connection shall be made above the level of the water seal; and
(ii) the top of the tundish shall be above the flood level rim of the fixture.

Pipes discharging over a tundish shall have an air gap of a size at least twice the internal diameter of the discharging pipe.

Tundishes shall be accessible.
11.22 DOMESTIC SWIMMING POOLS

The discharge from swimming pools shall be installed in accordance with Clause 10.9.

Overflows from skimmer boxes of domestic swimming pools shall discharge to an authorized discharge point nominated by the authority having jurisdiction.

The discharge from swimming pools to the sanitary plumbing and drainage system may require the approval of the network utility operator.

11.23 TROUGHS

11.23.1 Ablution

Ablution troughs shall be connected by—
(a) an untrapped wastepipe not smaller than DN 40 to a floor waste gully; or
(b) a trap and wastepipe not smaller than DN 50.

11.23.2 Laundry

Laundry troughs shall be connected by—
(a) an untrapped wastepipe not smaller than DN 40 to a floor waste gully; or
(b) a trap and wastepipe not smaller than DN 40.

11.24 URINALS

11.24.1 Slab type

Slab type urinals shall be connected directly to soil stacks or drains with a trap and discharge pipe not smaller than DN 65 for urinal walls up to 5 m in length. Additional outlets are required where the urinal wall is more than 5 m in length.

11.24.2 Wall-hung

11.24.2.1 General

The floor of a room containing one or more wall-hung urinals shall grade to a floor waste gully installed in accordance with Clause 4.6.7.

11.24.2.2 Flushing wall-hung urinals

Flushing wall-hung urinals (other than those with an integral trap) shall be connected to a trap not smaller than DN 40 (or DN 32, New Zealand only).

11.24.2.3 Non-flushing (waterless) urinals

Waterless wall-hung urinals with an integral cartridge seal or integral self-sealing mechanical device may be installed without an additional fixture trap or self-sealing mechanical device.

Prior to installing a waterless wall-hung urinal to an existing system, the installer shall determine the materials of the pipes in the existing system.

The undiluted discharge from the urinal shall not be transported through copper pipework.

11.24.3 Conversion to waterless urinals

Urinals shall not be converted into waterless urinals unless the wall-hung or slab urinal has been authorized for use as a waterless urinal, and the requirements of Clauses 11.24.2.1 and 11.24.2.3 have been satisfied.
11.25 WASHING MACHINES

11.25.1 Domestic clothes-washing machines
The pumped discharge from domestic clothes-washing machines shall be connected—
(a) over the rim or into the sud-saver connection of a laundry trough;
(b) into a trapped wastepipe not smaller than DN 40; or
(c) into trapped or untrapped wastepipe not smaller than DN 40 connected to a floor waste gully.

11.25.2 Domestic dishwashing machines
A typical connection of dishwashing machine is shown in Figure 11.1.

---

FIGURE 11.1 TYPICAL CONNECTION OF DOMESTIC DISHWASHING MACHINES

LEGEND:
DWM = dishwashing machine
11.25.2.1 Discharge
The pumped discharge from domestic dishwashing machines shall be connected—
(a) into a trapped wastepipe not smaller than DN 40;
(b) above the water seal of a DN 50 trap fitted to the outlet of a kitchen sink; or
(c) through a household food waste disposal unit.

11.25.2.2 Connection of outlet hose
Outlet hoses of domestic dishwashing machines shall be connected in accordance with the following:
(a) Where the outlet hose is connected above the water seal of a sink trap it shall be looped as close as possible to the underside of the sink drainer or benchtop before being extended downwards to the connection.
(b) If the trapped wastepipe to which the connection is made discharges directly to the drain, stack or common discharge pipe, the outlet hose shall be extended at least to the top of the dishwashing machine before looping downwards to the trapped wastepipe.

11.25.3 Commercial clothes-washing machines
NOTE: Trade waste discharge from commercial clothes-washing machines may require pre-treatment as determined by the network utility operator.

11.25.4 Commercial dishwashing machines
Commercial dishwashing machines shall be connected to a fixture trap and wastepipe not smaller than DN 50.
NOTE: Trade waste discharge from commercial dishwashers may require pre-treatment as determined by the network utility operator.

11.25.5 Glass-washing machines
Glass-washing machines shall be connected by—
(a) an untrapped wastepipe not smaller than DN 40 to a floor waste gully;
(b) a trap and wastepipe not smaller than DN 40; or
(c) a pump-out hose fitted in the same manner as domestic dishwashing machine (see Clause 11.25.2).

11.26 UNTRAPPED FLOOR DRAINS
11.26.1 General
An untrapped floor drain may be installed for the purpose of draining wastewater spillage from a floor in case of overflow.

11.26.2 Restrictions on use
An untrapped floor drain shall not—
(a) be connected to any stack or discharge pipe that connects directly to the drain; or
(b) be installed in any room that contains a urinal.
11.26.3 Installation

Each untrapped floor drain shall—
(a) be fixed and supported in accordance with Clause 9.2;
(b) have a removable grate of at least DN 40; and
(c) be connected to a separate, graded discharge pipe of at least DN 40.

11.26.4 Termination of discharge pipe

The outlet from an untrapped floor drain shall be located so that the discharge cannot cause damage or be a nuisance, and shall terminate either—
(a) internally over a tundish connected to a floor waste gully, in accordance with Clause 4.6.7.8; or
(b) externally with a flap and within 100 mm above finished surface level.

11.27 WATER CLOSET PANS

11.27.1 Connection

Water closet pans shall be connected directly to soil stacks or sanitary drains with a discharge pipe not smaller than DN 80.

11.27.2 Installation

Water closet pans shall be securely fixed by—
(a) bedding no thicker than 20 mm;
(b) brackets;
(c) corrosion-resistant fasteners; or
(d) as specified by the manufacturer.

Clause 12.2.3

Delete ‘NOTE’ and replace with the following:

NOTE: Provided protection against sewage overflow has been made as specified in Clause 4.6.6, any additional gully may have a lesser vertical separation than that specified in Clause 4.6.6.

Section 13

Delete text of Section 13 [as per Amendment No. 2 (2006)], and replace with the following:

SECTION 13 TESTING OF SANITARY PLUMBING AND SANITARY DRAINAGE INSTALLATIONS

13.1 GENERAL

This Section specifies requirements for the inspection and testing of sanitary plumbing and sanitary drainage installations.

All new, repaired or replaced sanitary plumbing and sanitary drainage shall be tested by hydrostatic, air pressure or vacuum testing to demonstrate that they are watertight. Testing shall be conducted prior to the placement of the trench fill (backfill).

Any defects shall either be repaired or replaced with pipes and fittings of a suitable material and the repaired or replaced section retested until it complies with this Section.
Sanitary fixtures shall be tested by subjecting them to normal use. After each test, the residual water seal in the trap of the fixture concerned or in any other trap connected to the same system shall, under normal operating conditions, retain a water seal of not less than 25 mm.

Where a water seal of not less than 25 mm cannot be retained under normal operating conditions, the installer shall inspect the sanitary plumbing and drainage system to determine the cause and undertake modifications or repairs, or both, and retest the sanitary fixture until it complies with this Clause.

In some cases it may be more cost-effective to renovate the existing drain using an approved trenchless rehabilitation technique, in which case the drain shall be tested and inspected after renovation.

Any renovation defects shall either be repaired or replaced with pipes and fittings of a suitable material and the repaired or replaced section retested and reinspected until it complies with this Section.

13.2 HYDROSTATIC TEST (WATER TEST)

Where the authority having jurisdiction or the network utility operator has a water management strategy that prohibits the use of water for specific purposes or has instituted water restrictions, hydrostatic testing of pipework may not be permitted, in which case an air or vacuum test shall be undertaken to verify that the sanitary plumbing and drainage pipework is satisfactory.

Where hydrostatic testing is used as a means for testing sanitary plumbing and sanitary drainage installations, non-drinking water may be used.

The sanitary plumbing and sanitary drainage shall be filled with water—

(a) in the case of sanitary drainage, to a height of not less than 1 m above the soffit level at the highest point of the section being tested;

(b) in the case of sanitary plumbing, to the spill level of the highest fixture or to the flood level of the lowest sanitary fixture, whichever is higher; and

(c) in either case, not exceeding 3 m at the lowest point of the test section.

The pressure shall be maintained without leakage for at least 15 min. The source of any leak shall then be ascertained and any defects repaired. The section under test shall then be retested.

13.3 AIR PRESSURE TEST

13.3.1 Sealing inlets and outlets

All sanitary plumbing and drainage inlets, outlets and access openings shall be capped and sealed. Air shall be introduced slowly into the section being tested.

13.3.2 Air pressure test procedure

An initial test pressure of approximately 15 kPa shall be applied to the section being tested. When approximately 15 kPa has been reached, the air pump and supply valve shall be shut off. Air pressure shall be allowed to stabilize for a minimum of 3 min while checking for leaks.

After the pressure has stabilized, commence the test by allowing the pressure to fall to 10 kPa and then begin recording the time and drop in pressure over the minimum test duration specified in Table 13.1.
13.3.3 Maximum pressure drop permitted

The section of sanitary plumbing or sanitary drainage being tested shall not have a drop in pressure greater than 3 kPa over the minimum test duration specified in Table 13.1.

13.4 VACUUM TEST

13.4.1 Sealing inlets and outlets

All sanitary plumbing and drainage inlets, outlets and access openings shall be capped and sealed.

13.4.2 Vacuum test procedure

An initial vacuum test pressure of approximately 15 kPa shall be applied to the section being tested. When approximately 15 kPa has been reached, the vacuum pump and supply valve shall be shut off. The vacuum shall be allowed to stabilize for a minimum of 3 min while checking for leaks.

After the pressure has stabilized, commence the test by allowing the vacuum to fall to 10 kPa and then begin recording the time and drop in vacuum over the minimum test duration specified in Table 13.1.

13.4.3 Maximum vacuum drop permitted

The section of sanitary plumbing or sanitary drainage being tested shall not have a drop in vacuum greater than 3 kPa over the minimum test duration specified in Table 13.1.

| Table 13.1 AIR PRESSURE AND VACUUM AIR TESTING ACCEPTANCE TIMES FOR 3 kPa PRESSURE CHANGE |
|-----------------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Pipe size | Test length, m | 50 | 100 | 150 | 120 | 250 | 300 |
| DN | Minimum test duration, min | | | | | | |
| 100 | | 2 | 2 | 2 | 2 | 3 | 3 |
| 150 | | 3 | 3 | 3 | 6 | 6 | 6 |
| 225 | | 4 | 5 | 8 | 10 | 13 | 15 |
| 300 | | 6 | 9 | 14 | 18 | 23 | 29 |

13.5 CLOSED CIRCUIT TELEVISION (CCTV) INSPECTION

NOTE: Where closed circuit television inspection of sanitary plumbing and drainage is required, it should be carried out by a suitably qualified expert in accordance with the requirements of Appendix E.

Appendix A

*Delete Appendix A and replace with the following:*
APPENDIX A

NORMATIVE REFERENCES

(Normative)

AS
1074 Steel tubes and tubulars for ordinary service
1345 Identification of the contents of pipes, conduits and ducts
1379 Specification and supply of concrete
1428 Design for access and mobility (All parts)
1432 Copper tubes for plumbing, gasfitting and drainage applications
1478 Chemical admixtures for concrete, mortar and grout
1478.1 Part 1: Admixtures for concrete
1566 Copper and copper alloys—Rolled flat products
1589 Copper and copper alloy waste fittings
1604 Specification for preservative treatment
1604.1 Part 1: Sawn and round timber
1631 Cast grey and ductile iron non-pressure pipes and fittings
1646 Elastomeric seals for waterworks purposes
1657 Fixed platforms, walkways, stairways and ladders—Design, construction and installation
1741 Vitrified clay pipes and fittings with flexible joints—Sewer quality
2129 Flanges for pipes, valves and fittings
2870 Residential slabs and footings—Construction
3501 Parallel screw threads of Whitworth form (BSW and BSF) and associated gauges and gauging practice
3517 Capillary fittings of copper and copper alloy for non-pressure sanitary plumbing applications
3517.1 Part 1: Pressure and non-pressure drainage and sewerage (ISO 10467:2004, MOD)
3571 Plastics piping systems—Glass-reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin
3600 Concrete structures
3688 Water supply—Copper and copper alloy body compression and capillary fittings and threaded-end connectors
3795 Copper alloy tubes for plumbing and drainage applications
4087 Metallic flanges for waterworks purposes
4139 Fibre reinforced concrete pipes and fittings
5200 Plumbing and drainage products
5200.000 Part 000: Procedures for certification of plumbing and drainage products

AS/NZS
1167 Welding and brazing—Filler metals
1167.1 Part 1: Filler metal for brazing and braze welding
1167.2 Part 2: Filler metal for welding
AS/NZS
1260 PVC-U pipes and fittings for drain, waste and vent applications
1546 On-site domestic wastewater treatment units
1546.1 Part 1: Septic tanks
1546.2 Part 2: Waterless composting toilets
1546.3 Part 3: Aerated wastewater treatment systems
2032 Installation of PVC pipe systems
2033 Installation of polyethylene pipe systems
2280 Ductile iron pressure pipes and fittings
2544 Grey iron pressure fittings
2648 Underground marking tape
2648.1 Part 1: Non-detectable tape
2878 Timbers—Classification into strength groups
3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)
3500 Plumbing and drainage
3500.0 Part 0: Glossary of terms
3500.1 Part 4: Water services
3879 Solvent cements and priming fluids for PVC (PVC-U and PVC-M) and ABS pipes and fittings
4331 Metallic flanges
4401 Plastics piping systems for soil and waste discharge (low and high temperature) inside buildings—Polyethylene (PE)
4671 Steel reinforcing materials
4680 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
4936 Air admittance valves (AAVs) for use in sanitary plumbing and drainage systems
4999(Int) PVC-U maintenance shafts
5065 Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications
7671 Plastics piping systems for soil and waste discharge (low and high temperature) inside buildings—Polypropylene (PP)
NZS
3109 Specification for concrete construction
3113 Specification for chemical admixtures for concrete
3124 Specification for concrete construction for minor works
3640 Specification for the minimum requirements of the NZ Timber Preservation Council Inc.
5807 Code of practice for industrial identification by colour, wording or other coding
7643 Code of practice for the installation of unplasticized PVC pipe systems
NZS/BS
1387 Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads
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<tr>
<th>Standards</th>
<th>Description</th>
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<tr>
<td>BS 2598</td>
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<td>Part 4: Specification for glass plant components</td>
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<td>BS EN 295-1</td>
<td>Vitrified clay pipes and fittings and pipe joints for drains and sewers—Requirements</td>
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<td>Stainless steels</td>
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<tr>
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<td>Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications</td>
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<td>Standard Specification for Seamless and Welded Austenitic and Ferritic/Austenitic Stainless Steel Sanitary Tubing</td>
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<td>Plumbing Code of Australia</td>
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<tr>
<td>NZBC</td>
<td>New Zealand Building Code (G13/AS2, Foul water, acceptable solution)</td>
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<td>Industry Standard for ABS Non-pressure Pipe and Fittings</td>
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**Appendix C, Item (l)**

*Delete ‘ISO 7671’ and replace with ‘AS/NZS 7671’.*
**Appendix D**

Delete Appendix D and replace with the following:

## APPENDIX D

**MAXIMUM LENGTH (m) OF FIXTURE DISCHARGE PIPE WITHOUT VENTING**

(Normative)

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<thead>
<tr>
<th>Fixture</th>
<th>Floor waste gully</th>
<th>Disconnector gully</th>
<th>Vented drain</th>
<th>Reduced velocity aerated stack system</th>
<th>Fully vented (modified)</th>
<th>Single stack</th>
<th>Single stack (modified)</th>
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(continued)
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<th>Fixture</th>
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<th>Single stack (modified)</th>
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<tr>
<td></td>
<td>Ref. Clause 4.6.7.3 Figure 4.2 Table 4.4 (see Notes 3 &amp; 5)</td>
<td>Ref. Clause 4.6 Figure 4.1</td>
<td>Ref. Clause 3.10 Figure 3.6</td>
<td>Ref. Clause 9A.6,</td>
<td>Ref. Clause 7.5.7.5.4 Clause 7.5.7.5.5 Figure 7.11</td>
<td>Ref. Clause 8.2</td>
<td>Ref. Clause 8.2.3 Figure 8.2 Table 8.2</td>
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<th>Floor waste gully</th>
<th>Disconnector gully</th>
<th>Vented drain</th>
<th>Reduced velocity aerated stack system</th>
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<td>Ref. Clause 4.6.7.3 Figure 4.2 Table 4.4 (see Notes 3 &amp; 5)</td>
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<td>Ref. Clause 3.10 Figure 3.6 Table 3.6</td>
<td>Ref. Clause 9A.6</td>
<td>Ref. Clause 7.5.7.5.4 Clause 7.5.7.5.5 Figure 7.11</td>
<td>Ref. Clause 8.2 Figure 8.1 Table 8.2</td>
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NOTES:
1. NP = not permitted.
2. For the topmost fixture to fully vented modified stacks, see Clause 7.5.1.2.
3. Wastepipes to floor waste gullies shall not be extended by venting.
4. ‘Minor discharge’, approximately a minimum of 1 L per day and not more than 20 L per day.
5. For submerged-inlet floor waste gullies the requirements are specified in Table 4.4.
6. For connections of fixtures in range, see Clause 8.5.10.
7. Over 5 m of urinal wall additional outlets required.
8. Discharge through a DN 100 tundish or installed to manufacturer’s instructions.
9. See Clause 8.4.2, Item (a) for connection of slab type urinals to single stacks.
APPENDIX E

CONDUCT OF INSPECTIONS BY THE USE OF CLOSED CIRCUIT TELEVISION (CCTV)

(Informative)

E1 GENERAL

CCTV inspections are effective ways to identify the structural condition of sanitary plumbing and drainage installations and to identify and report on any specific defects or features.

Inspections should be conducted under no-flow conditions; that is the sanitary plumbing system is not being used so that the flow (water) level may be measured and reported.

Typical applications for CCTV Surveys include—

(a) inspection of drains, sewers and pipelines;
(b) inspection of deep shafts;
(c) inspection of ducts;
(d) monitoring specialist repair works in sewers; and
(e) surveys of industrial process pipelines.

Where required, specialized instruments, apparatus and/or software should be used to facilitate the survey. Hardware and software used in measuring the parameters have to be correctly calibrated for each application using the manufacturer’s recommended methods.

NOTE: It is recommended that CCTV operators are trained to conduct CCTV inspections and investigations.

E2 OPERATORS REPORT

The operator should provide a written report in hard copy and/or electronic format on the location and characteristics of reportable features, including defects and features of interest together with such header details necessary to define the details of the inspection.

Reports have to be prepared and submitted in hard copy. Reports should include a summary of all recorded defects and observations where the authority having jurisdiction is required to make a determination for acceptance.

The report should contain, but not be limited to, the following:

(a) Location of the sanitary plumbing and drainage installation.
(b) The date(s) of inspections.
(c) Details as required to identify the drain(s) inspected.
(d) Size and type of material installed.
(e) Condition of the sanitary plumbing and drainage installation.
BIBLIOGRAPHY

Insert the following after Appendix E:

BIBLIOGRAPHY

AS 3706  Geotextiles—Methods of test
3706.0 Part 0: General introduction and list of methods
BCA Building Code of Australia