

Australian/New Zealand Standard™

National plumbing and drainage

**Part 2.2: Sanitary plumbing and
drainage—Acceptable solutions**



Standards Australia



AS/NZS 3500.2.2:1996

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Australian/New Zealand Standard™

National plumbing and drainage

Part 2.2: Sanitary plumbing and drainage—Acceptable solutions

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee WS/14 on the National Plumbing and Drainage Code, to supersede AS 3500.2—1990.

This Standard incorporates Amendment No. 1 (August 1999) and Amendment No. 2 (September 2002). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The object of this revision is to issue it as a Joint Australian/New Zealand Standard and incorporate amendments and additions arising from industry requirements.

This Standard has been written in a format setting out minimum deemed-to-satisfy requirements compatible with legislation of authorities who can enforce regulations and authorize products for connection to their systems.

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.

Attention is drawn to the publication of SAA Rul PL/1, Rulings to the Joint Australia/New Zealand Plumbing and Drainage Code. Where Rulings of public significance are issued, they will be available from Standards Australia through a subscription service or by individual purchase; the subscription is a single charge for the issue of Rulings for the life of this edition of AS/NZS 3500.2.2. When rulings are included in an amendment, the specific ruling will be withdrawn at the time of publication of the amendment. Enquiries should be directed to Standards Australia.

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FOREWORD

STATUTORY REQUIREMENTS

Attention is drawn to the relevant statutory requirements with respect to—

- (a) the qualifications of persons permitted by law to do plumbing or drainage work;
- (b) the administrative procedures to be followed by persons performing plumbing or drainage work; and
- (c) the authorization of certain materials, products, fixtures, fittings and other components for connection to sewerage systems.

RULINGS AND INTERPRETATIONS

Enquires concerning the interpretation of specific Clauses contained in AS/NZS 3500.2.2 should be directed initially to the regulatory authority responsible for the locality within which work is, or is to be, conducted. In the event that further clarification is required, the enquiry may be directed in writing to Committee WS/14, which is responsible for the Joint Australian/New Zealand National Plumbing and Drainage Code. The Projects Manager, Committee WS/14, Standards Australia will process enquires and issue replies.

PROVISION FOR REVISION

This Standard necessarily deals with existing conditions, but is not intended to discourage invention 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.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**National plumbing and drainage****Part 2.2: Sanitary plumbing and drainage—Acceptable solutions**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

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

Construction of a sanitary plumbing and drainage installation in accordance with this Standard is deemed to satisfy the requirements of AS 3500.2.1.

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.

1.2 REFERENCED DOCUMENTS

The documents referred to in this Standard are listed in Appendix A.

1.3 DEFINITIONS

For the purpose of this Standard the definitions given in AS/NZS 3500.0 and those below apply.

1.3.1 Acceptable procedure

A1 | Acceptable solution—deemed to satisfy.

1.3.2 Deemed to satisfy

Deemed to satisfy—where a provision states that the use of a particular material, component, method of construction or design satisfies a performance requirement of this Standard that provision does not require its use. An equivalent material, component, method or design may be used if it meets the level of performance prescribed by the provision concerned.

1.4 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).

1.5 PIPE GRADES

In this Standard, pipe grades are expressed as a percentage of vertical to horizontal distances. The equivalent grades expressed as a ratio (vertical:horizontal) are given in Appendix B.

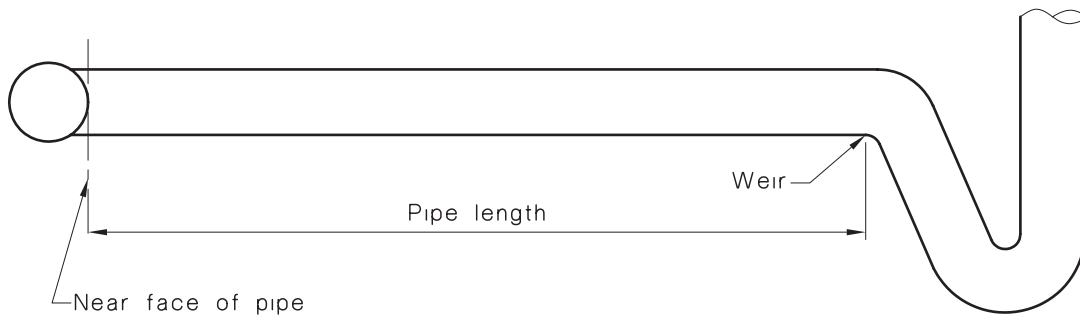


FIGURE 1.1 PIPE LENGTH (METHOD OF MEASUREMENT)

SECTION 2 MATERIALS AND PRODUCTS

2.1 SCOPE OF SECTION

This Section specifies material and product requirements. Alternative materials or methods may be used if proven to be equal to or better than those specifically referred to herein.

2.2 AUTHORIZATION

Materials and products used in the installation shall comply with the relevant statutory requirements for authorization and with this Standard.

NOTE: In Australia refer to SAA MP52, in New Zealand refer to the regulating authority.

2.3 SELECTION AND USE

The materials and products used shall be selected to ensure satisfactory service for the life of the installation. Factors to be taken into account include—

- (a) the type of usage likely to occur and the nature of the liquids to be conveyed;
- (b) the nature of the ground and the possibility of chemical attack therefrom;
- (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; and
- (e) the range of temperatures likely to discharge to the drainage system.

2.4 LIMITATIONS ON USE OF PIPES AND FITTINGS FOR NON-PRESSURE APPLICATIONS

2.4.1 Copper pipes

The following limitations shall apply to the use of copper pipes:

- (a) Copper pipes shall not be used to convey discharges from urinals only, but are permitted where the flow is diluted.
- (b) Type B pipes shall not be bent in the field beyond an offset angle of 10°.
- (c) Type D pipes shall not be used for sanitary drainage below ground.
- (d) Type D pipes shall be used in straight lengths only and shall not be offset by bending.
- (e) Copper pipes shall not be used at all in connection with grease arrestors.
- (f) Copper pipes shall not be used in waste lines receiving trade waste discharges which could have a deleterious effect upon the copper, e.g. wastes from photographic equipment or cooling towers.

2.4.2 Copper fittings

The following limitations shall apply to the use of copper fittings:

- (a) Copper fittings shall not be used to convey discharges from urinals only, but are permitted where the flow is diluted.
- (b) All fabricated bends and junctions at the base of stacks up to 9 m in height shall be formed of Type B or heavier gauge material.
- (c) Bends and junctions at the base of stacks greater than 9 m in height shall be formed of cast or hot-pressed copper alloy.
- (d) Copper fittings shall not be used at all in connection with grease arrestors.

2.4.3 Copper alloy pipes and fittings

The following limitations shall apply:

- (a) Copper alloy pipes shall not be bent or offset.
- (b) No fitting other than a junction shall be fabricated in the field.

2.4.4 Galvanized steel

The following limitations shall apply to the use of galvanized steel pipes and fittings which shall—

- (a) not be used for the conveyance of discharge from soil fixtures;
- (b) not be cement-lined;
- (c) not be bent; and
- (d) only be installed in accessible locations.

2.4.5 Glass

Glass pipes and fittings shall be made from high grade, low thermal expansion, borosilicate glass to BS 2598: Part 4.

2.4.6 Glass-filament-reinforced thermosetting plastic (GRP) pipes

2.4.6.1 *Specifications*

GRP pipes shall comply with AS 3571.

2.4.6.2 *Limitations on use*

The following limitations shall apply to the use of GRP pipes which shall—

- (a) be resistant to ultraviolet light when used above ground; and
- (b) have a minimum pipe stiffness of 5000 N/m deflection per metre length when installed below ground.

2.4.7 'Not used'

2.4.8 Polypropylene pipes and fittings

Polypropylene pipes and fittings shall only be used within buildings in locations not exposed to direct sunlight.

2.4.9 Unplasticized polyvinyl chloride (UPVC)

Pipes and fittings complying with AS 1260, NZS 7641 or NZS 7649 shall be installed in a manner protecting it from UV degradation. For jointing refer to AS/NZS 3879.

2.4.10 Fibre-reinforced concrete (FRC) pipes

FRC pipes and fittings shall comply with AS 4139. The following limitations shall apply to the use of FRC pipes.

FRC pipes shall not be used in waste lines receiving trade waste discharges which could have a deleterious effect upon the FRC e.g. wastes from photographic equipment or cooling towers.

2.4.11 Vitrified clay

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).

A1 2.4.12 High density polyethylene (HDPE)

The following limitations shall apply to the use of high density polyethylene pipes and fittings:

- (a) For installation purposes—
 - (i) The jointing of pipes and fittings, handling and general installation requirements shall be in accordance with AS 2033 (or NZS/AS 2033) and the manufacturer's instructions.
 - (ii) When passing through concrete footings, pipes and fittings shall be wrapped with an impermeable flexible sheath of not less than 6 mm thick or as specified by a structural engineer; and
 - (iii) When fully encased in concrete structures, subject to the approval of a structural engineer, pipes and fittings shall be installed in accordance with the manufacturer's instructions (see Clause 9.4.3).

2.4.13 Stainless steel pipes and fittings

The following limitations shall apply to the use of stainless steel pipes and fittings:

- (a) Austenitic stainless steel pipes and fittings shall be Type 304, 304L, 316 or 316L complying with ASTM A240/A240M.
- (b) The fabrication of fittings and assemblies, including bending, shall not be permitted in the field.
- (c) Stainless steel drains to be installed below ground surface shall be Type 316.

2.5 PIPES AND FITTINGS FOR PRESSURE APPLICATIONS

Pipes and fittings for pressure applications shall comply with the relevant parts of Section 2 of AS 3500.1.

2.6 SHEET**2.6.1 Copper****2.6.1.1 Specification**

Copper sheet shall be alloy 122 complying with AS 1566.

2.6.1.2 Limitations on use

The following limitations shall apply to the use of copper sheet:

- (a) When used to form external vent pipes, the thickness shall be not less than 0.65 mm.
- (b) When used to fabricate wet wells, the thickness shall be not less than 1.2 mm.

2.6.2 Copper alloy

When used to fabricate wet wells, the thickness of copper alloy sheet shall be not less than 1.2 mm.

2.6.3 Stainless steel

Stainless steel sheet shall be alloy 304 complying with AS 1449, and shall be not less than 1.2 mm thick.

2.7 JOINTING COMPONENTS**2.7.1 Rubber rings**

Rubber rings shall be of dimensions, composition and hardness appropriate to the material being joined and for the particular application.

2.7.2 Rubber gaskets

The properties of gasket materials shall comply with AS 1646 or NZS/BS 2494, as appropriate.

2.7.3 Silver brazing alloy

Silver brazing alloys used for jointing copper and copper alloy pipes and fittings shall have a silver content of not less than 1.8%.

2.7.4 Solvent cement and priming fluid

Solvent cement and priming fluid used for jointing UPVC pipes and fittings, shall comply with AS/NZS 3879. This application of the solvent cement and priming fluid shall be in accordance with AS 2032 or NZS 7643.

2.8 CONCRETE AND MORTAR

2.8.1 Cement

Cement shall be portland cement complying with AS 3972 or NZS 3122. In inspection chambers with an open channel, sulfate-resistant cement shall be used.

2.8.2 Fine aggregate (sand)

Fine aggregate shall comply with AS 2758.1 or NZS 3121.

2.8.3 Coarse aggregate (metal)

Coarse aggregate shall comply with AS 2758.1, or NZS 3121 and shall not exceed 20 mm nominal size.

2.8.4 Concrete mix

Ready-mixed concrete shall comply with AS 1379 and shall have a minimum characteristic compressive strength (f'_c) 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. They shall have sufficient water added to make the mix workable, and shall have a minimum (f'_c) of 20 MPa.

2.8.5 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.

For bedding pipes, a mixture consisting of one part of cement to four parts of fine aggregate may be used.

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

2.8.6 Chemical admixtures

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

2.8.7 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.

2.8.8 Steel reinforcement

Steel reinforcing bars used in concrete structures shall comply with AS 1302 or NZS 3402.

Steel-welded mesh reinforcing fabric used in concrete structures shall comply with AS 1304 or NZS 3422.

2.9 MISCELLANEOUS

2.9.1 Timber

Timber exposed to the weather shall be of durability Class 2 complying with AS 2878, NZS 3631, or shall be treated in accordance with AS 1604 or NZS 3640.

2.9.2 Epoxy resins

Epoxy resins shall be compatible with the materials being joined.

2.9.3 Pipe bedding

Pipe bedding materials shall comply with Clause 5.4.

2.9.4 Backfill

Backfill material shall comply with Clause 5.5.

2.9.5 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 may require additional protection if installed in rock or in stony ground.

2.9.6 Fibreglass reinforced plastic tanks

Fibreglass reinforced plastic tanks shall be manufactured in accordance with BS 4994 and shall—

- (a) be not less than 5 mm in thickness; and
- (b) have tank surfaces with not less than a 1 mm thick, resin rich, layered finish.

2.9.7 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.

SECTION 3 DRAINAGE DESIGN

3.1 SCOPE OF SECTION

This Section sets out the requirements for the design of sanitary drainage systems. (See Appendix C.)

3.2 LOCATION OF DRAINS

Drains shall comply with the following:

- (a) Drains should be located external to the building wherever practical.
- (b) Where permitted, any drain located under or inside a building shall only serve fixtures within that building.

3.3 SIZE OF DRAINS

3.3.1 Fixture unit loading

The size of a vented drain shall be determined by the number of fixture units 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 branch drains

Not more than two water closet pans shall be connected to vented DN 80 drains, and the size of fixture discharge pipes from any bath or laundry trough 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 level with the soffit of the pipe to which it connects.

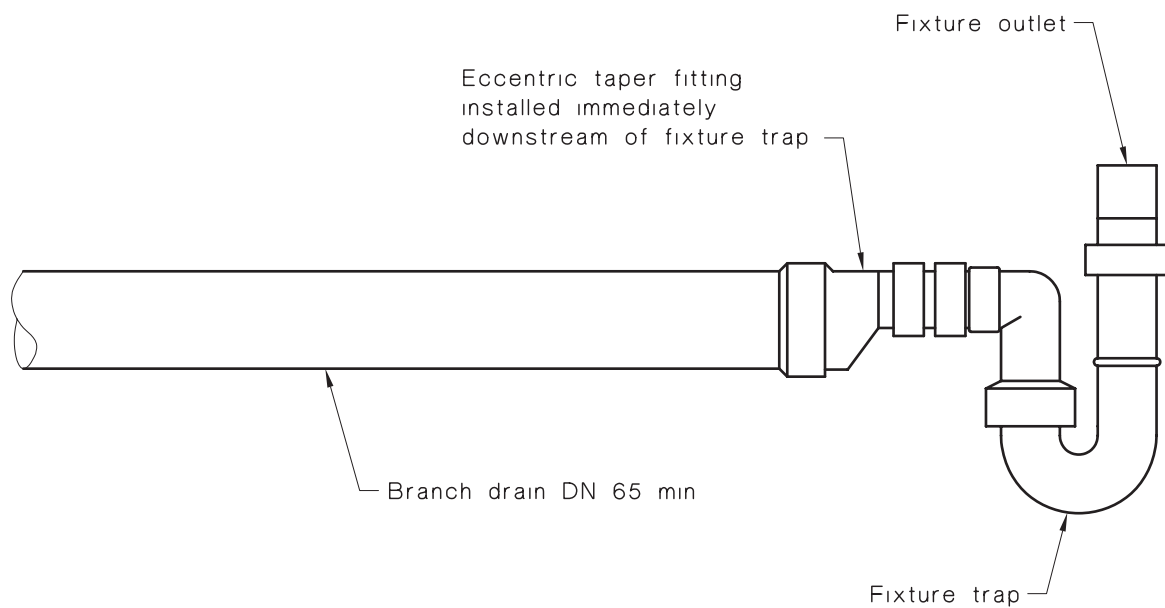


FIGURE 3.1 CONNECTION OF FIXTURE TRAPS (DN 40 OR DN 50) ON GRADE TO BRANCH DRAINS

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 oversized for the sole purpose of acquiring a grade less than the minimum grade specified in Table 3.2.

TABLE 3.1
MAXIMUM FIXTURE UNIT LOADING FOR VENTED DRAINS

Grade, %	Nominal size of drain, DN						
	65 (Note 1)	80	100	125	150	225	300
5.00	60	215	515	1 450	2 920	11 900	26 900
3.35	36	140	345	1 040	2 200	9 490	21 800
2.50	25	100	255	815	1 790	8 060	18 700
2.00	×	76	205	665	1 510	7 090	16 600
1.65	×	61	165	560	1 310	6 370	15 000
1.45	×	(50)	(140)	485	1 160	5 810	13 900
1.25	×	(42)	(120)	425	1 040	5 360	12 900
1.10	×	×	×	(380)	935	4 970	12 100
1.00	×	×	×	(340)	855	4 500	11 400
0.85	×	×	×	×	(725)	3 850	10 300
0.65	×	×	×	×	(595)	3 250	9 090
0.50	×	×	×	×	×	×	7 720
0.40	×	×	×	×	×	×	6 780

NOTES:

- 1 DN 65 pipe is permitted to be used in branch drains only, provided that no soil fixtures (except urinals) are connected thereto.
- 2 '×' 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

3.4.1 Minimum grade

The normal minimum grade of vented and unvented 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
MINIMUM GRADES OF DRAINS

Nominal size DN	Minimum grade, %
65	2.50
80	1.65
100	1.65
125	1.25
150	1.00
225	0.65
300	0.40

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

TABLE 3.3
**MINIMUM FIXTURE UNIT LOADINGS
FOR REDUCED GRADE DRAINS**

Reduced grade %	Nominal size of drain, DN			
	80	100	125	150
1.45	9	10	—	—
1.25	10	18	—	—
1.10	×	×	27	—
1.00	×	×	38	—
0.85	×	×	×	75
0.65	×	×	×	160

NOTES:

- 1 '×' 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.

A1 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—

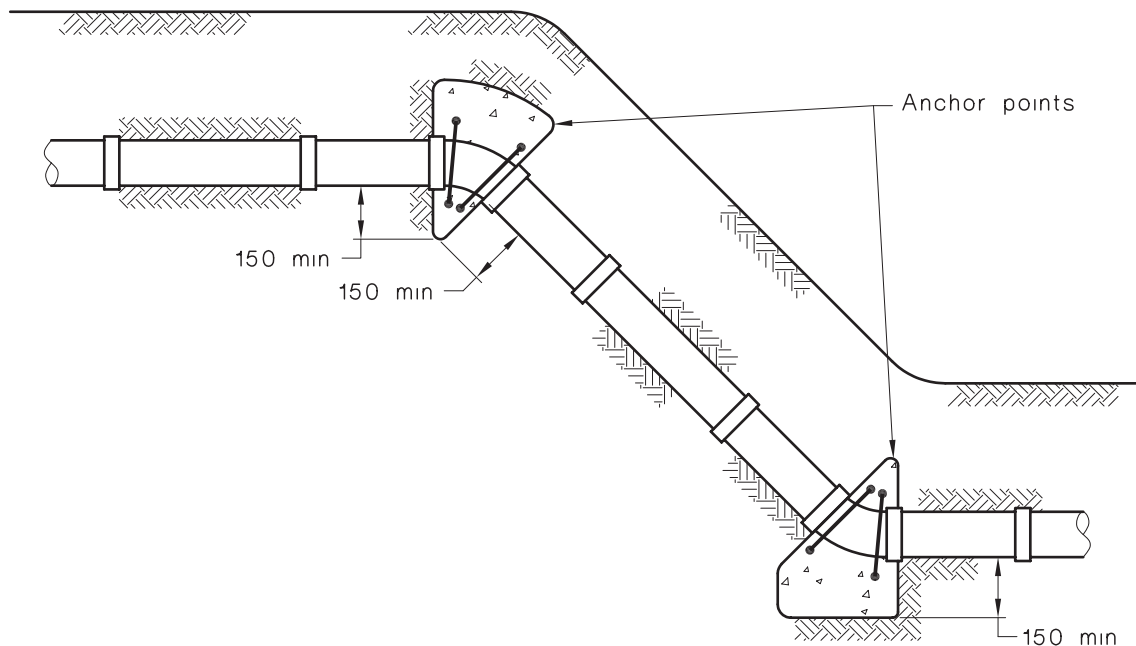
- (a) at the bend or junction at the top and bottom of the inclined drain; and
- (b) at intervals not exceeding 3 m.

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.



DIMENSIONS IN MILLIMETRES

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, which 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.
- (b) Where the presence of any obstacle prevents the drain from being laid at an even grade and with the required cover, then, wherever practicable, the drain shall pass beneath the obstacle at an even grade with a jump-up permitted only at the point of connection. If this is not practicable, a minimum clearance of 25 mm shall be provided between the obstacle and the drain, or an inclined section may be installed adjacent to the obstacle in the form of a graded jump-up with changes of direction not greater than 60°.
- (c) The drain shall have the minimum cover specified in Table 3.4.
- (d) Drains in watercourses shall be installed in accordance with the requirements of the authority controlling the watercourse or channel.

3.5.2 Easements and watercourses

Drains crossing an easement or a watercourse shall be installed in accordance with the following:

- (a) The drain shall pass under or over any pipeline or closed conduit in the easement or under any open channel or watercourse.
- (b) In an easement, a minimum clearance of 25 mm shall be maintained between an open channel, pipeline or conduit and the drain.
- (c) No drain shall be laid through any such obstacle as outlined in Item (a).
- (d) Where the drain is to pass over any obstacle as set out in Item (a), the drain shall have the minimum cover specified in Clause 3.7.2.

3.5.3 Public roads and rights of way

Where a drain is to be located in a public road or right of way, it shall be laid in accordance with the following:

- (a) The drain shall be laid at the depth specified in Table 3.4.
- (b) No fitting, forming part of a sewerage installation, shall be installed at or above ground level.

3.6 PROXIMITY TO OTHER SERVICES

Above and below ground drains shall be installed as follows:

- (a) No potential safety hazard is created when in close proximity to other services.
- (b) Access for maintenance and potential branch insertions is not impaired by other services.
- (c) Any below ground crossover of a drain shall—
 - (i) cross at an angle of not less than 45°;
 - (ii) have a vertical separation of not less than 100 mm; and
 - (iii) be suitably marked with warning tape.

NOTES:

- 1 The proximity to other services will vary, depending on the type and size of the services affected.
- 2 For shared trenching, an Australian Standard is in the course of preparation.

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 Drains with adequate cover

Drains shall be laid with a depth of cover, measured from the top of the pipe socket or inspection opening to the ground surface, as specified in Table 3.4, unless the manufacturer recommends a greater depth of cover.

TABLE 3.4
MINIMUM DEPTH OF COVER

Location	Minimum depth of cover, mm	
	Cast iron, Ductile iron	Other authorized materials
Public roads, rights of way, and other places subject to heavy vehicular traffic	300	500
Other driveways	300	450
Elsewhere	Nil	300*

* Except as provided in Clauses 3.7.3 and 3.7.4

3.7.3 Drains without adequate 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;
- (c) 50 mm minimum thickness of brick or concrete paving, where not subject to vehicular traffic;
- (d) the paving shall extend the full width of the trench; or
- (e) 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.

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 as specified in Clause 3.8.2 have been provided, or 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.

3.8.2 Drains in proximity to footings and foundations

Drains in proximity to footings and foundations shall comply with the following:

- (a) Drains shall pass under a strip footing at not less than 45° and have a minimum clearance of 25 mm from the top of the pipe to the underside of any footing.

- (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 that—
 - (i) two flexible joints are provided externally within 600 mm of the external face of the wall, and such joints are not less than 300 mm apart; and
 - (ii) the penetration of the wall is made watertight.
- (d) Where a drain is to be laid parallel to a footing, the excavation shall comply with Clause 5.2 and Figure 3.3.
- (e) Drains and pipes passing through walls and footings shall comply with the structural engineering specifications for the project.

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 providing 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.

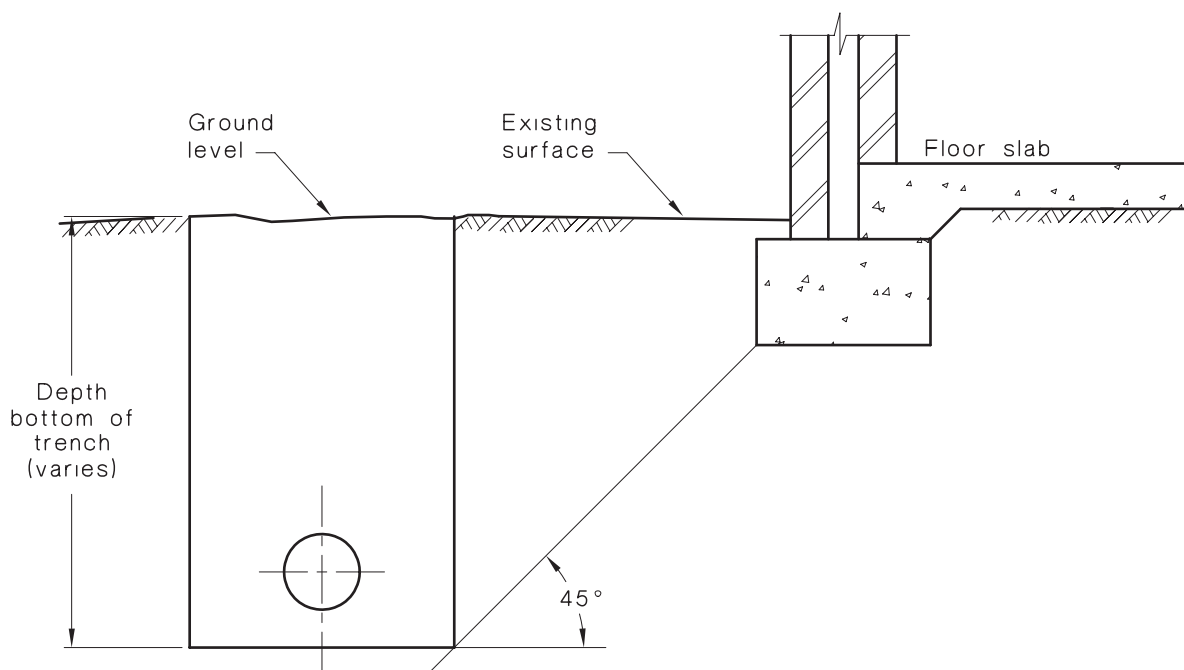


FIGURE 3.3 TYPICAL FOOTING DETAIL

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;
- (e) 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.

3.9.2 Location

3.9.2.1 Upstream vent

The upstream vent on any main drain shall be not less than DN 50 and 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

The section of drain acting as a vent shall be not less than DN 65. Notwithstanding the number of fixture units discharging to the drain, the minimum size of any ground vent pipe shall be DN 50.(see Figure 3.4)

NOTE: Branches connected into a positive pressure area, such as near boundary traps in multi-storey 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.

TABLE 3.5
SIZE AND RATING OF VENTS

Size of vent pipe DN	Fixture units discharging to drain		Vent rating
40	>1	≤10	0.5
50	>10	≤30	1
65	>30	≤175	2
80	>175	≤400	3
100	>400		6

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 3.4.

Example:

Loading in fixture units discharging to drain = 36.

Required size of drainage vent = DN 65 (rating of 2).

Other vents on drain are two DN 50 vents which give a combined rating of 2.

The two other stack or drainage vents in combination may take the place of a single DN 65 vent.

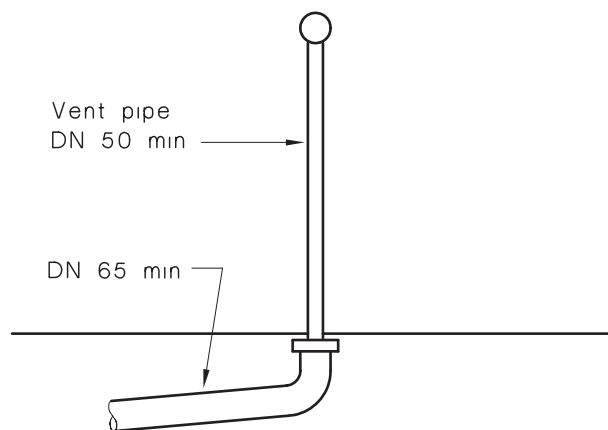


FIGURE 3.4 TYPICAL CONNECTION OF VENT TO DRAIN

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 9.10); or
- (b) connections to a disconnector 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.

A1 3.10.3 Maximum length

The maximum combined length of an unvented branch drain and fixture discharge pipe (see Figure 3.5) shall be as follows:

- (a) 10 m from the vented drain to the weir of the fixture trap, provided that where the discharge pipe size is smaller than the unvented drain size, the maximum length of discharge pipe shall not exceed—
- (i) 2 m for water closet pans with DN 80 outlets;
 - (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, or a sullage dump point located in a caravan park.
- (c) The unvented branch drain and fixture discharge pipe shall be installed in accordance with Clause 3.10.4, 3.10.5 and Figure 3.5.

TABLE 3.6
SIZE OF UNVENTED BRANCH DRAINS

Size of pipe DN	Maximum fixture unit loading
65	5 fixture units (excluding a water closet pan or slop hopper); or 10 fixture units from one floor waste gully
80	12 fixture units (including not more than one water closet pan or slop hopper)
100	30 fixture units (including not more than two water closet pans or 2 slop hoppers)

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 7.11.5.4 and 7.11.5.5 and Figure 3.5.

3.11 UNVENTED DRAINS DISCHARGING TO GULLIES

3.11.1 General

A drain that receives only the discharge from waste fixtures may connect 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 7.5.

3.12 INLET PIPE TO DISCONNECTOR GULLY

Where the inlet pipe to a disconnector gully is DN 65 or larger, multiple branches can be connected to such inlet pipe provided all fixture traps are within 10 m of the disconnector gully seal 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 6.6.1 and Figure 6.5.

3.14 RE-USE OF EXISTING DRAINS

When a building is to be demolished for redevelopment, the following requirements shall be observed:

- (a) Mortar jointed vitrified clay pipes shall not be re-used.
- (b) Drains constructed of other authorized materials shall not be re-used until they have been tested in accordance with Clause 12.3 and found to be satisfactory and in compliance with this Standard.

NOTES:

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

3.15 DRAINS IN CARAVAN PARKS

3.15.1 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.

3.15.2 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 3.6):

- (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.

3.15.3 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 3.7 or Figure 3.8.

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.

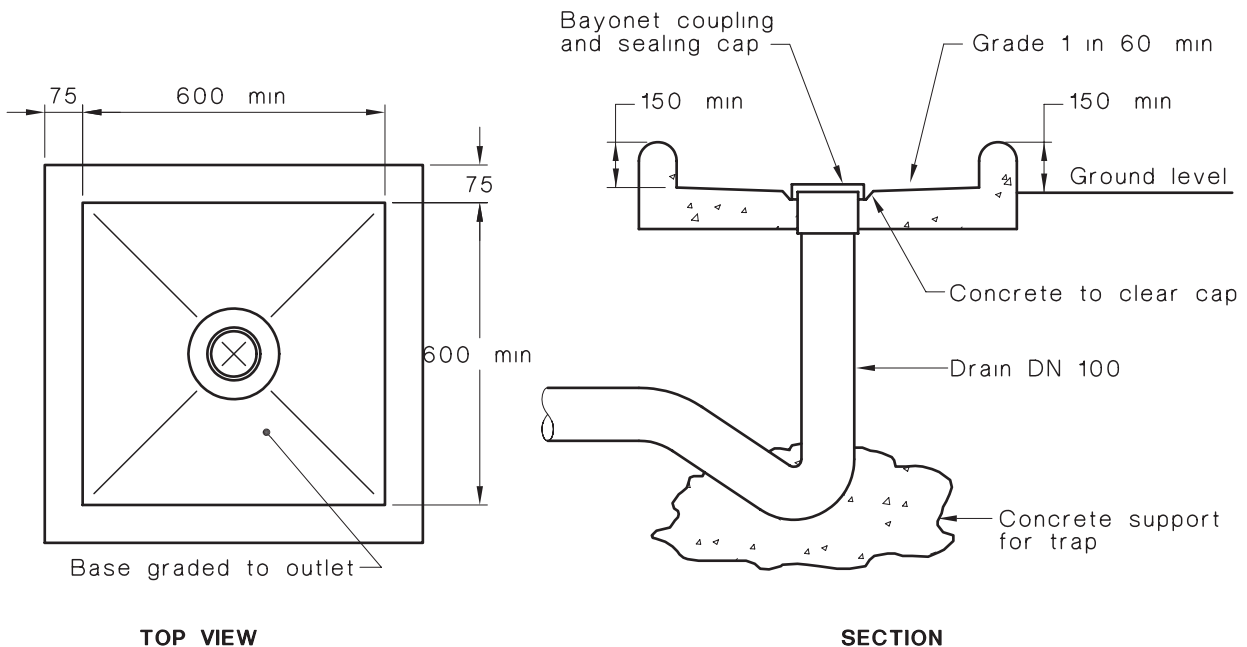
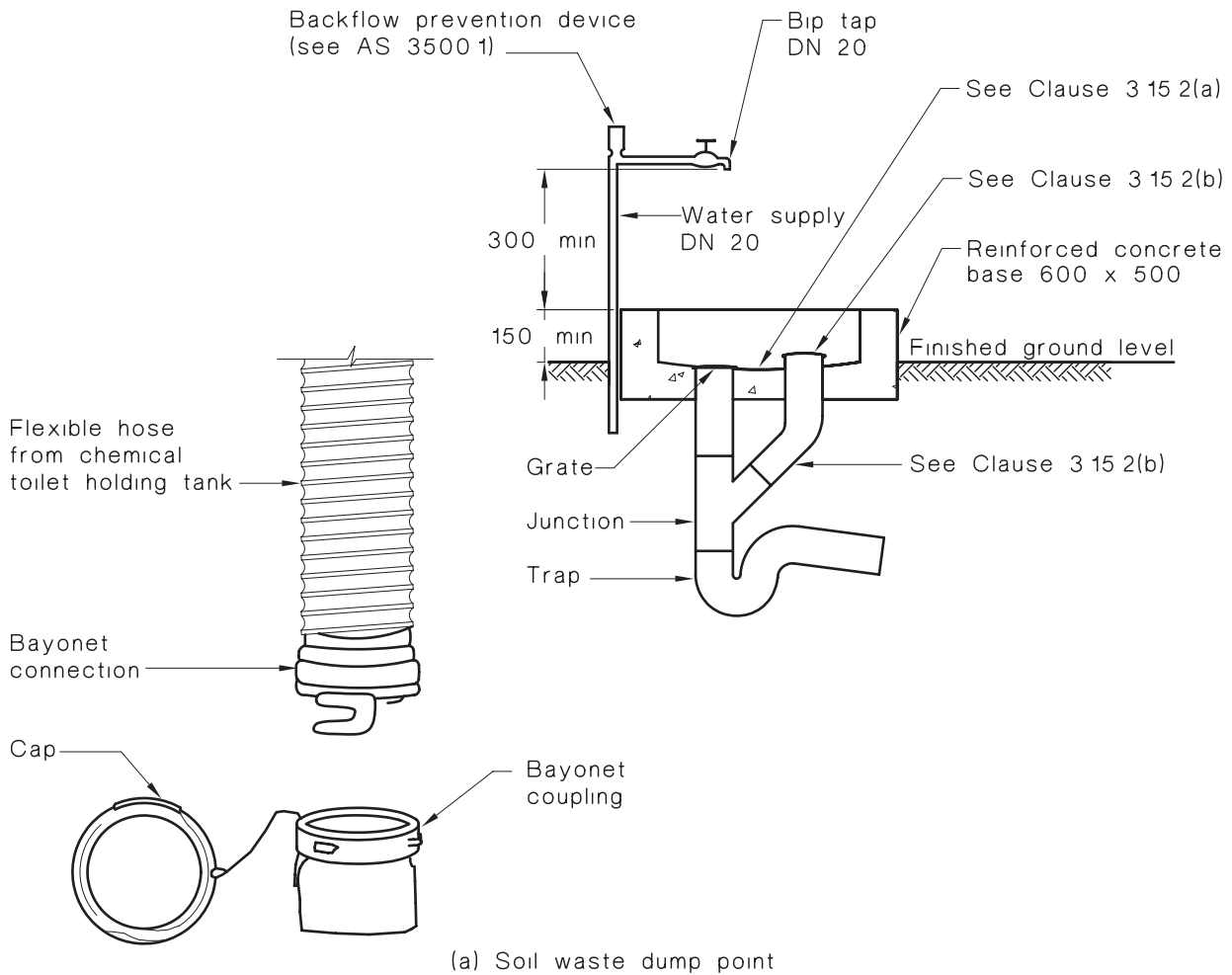
3.15.4 Relocatable dwellings located on long-term sites

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.

3.16 VACUUM SYSTEMS

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

- (a) Jump-ups shall be avoided.
- (b) An inspection shaft connected to the drain with a junction shall be placed as close as practicable to, and upstream of, the vacuum chamber.
- (c) 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 chamber.
- (d) Where more than one drain is connected to a vacuum chamber, the spill level of both overflow gullies of the drains shall be installed level with each other wherever possible.
- (e) A DN 100 vent pipe shall be provided on each drain connected to a vacuum chamber.

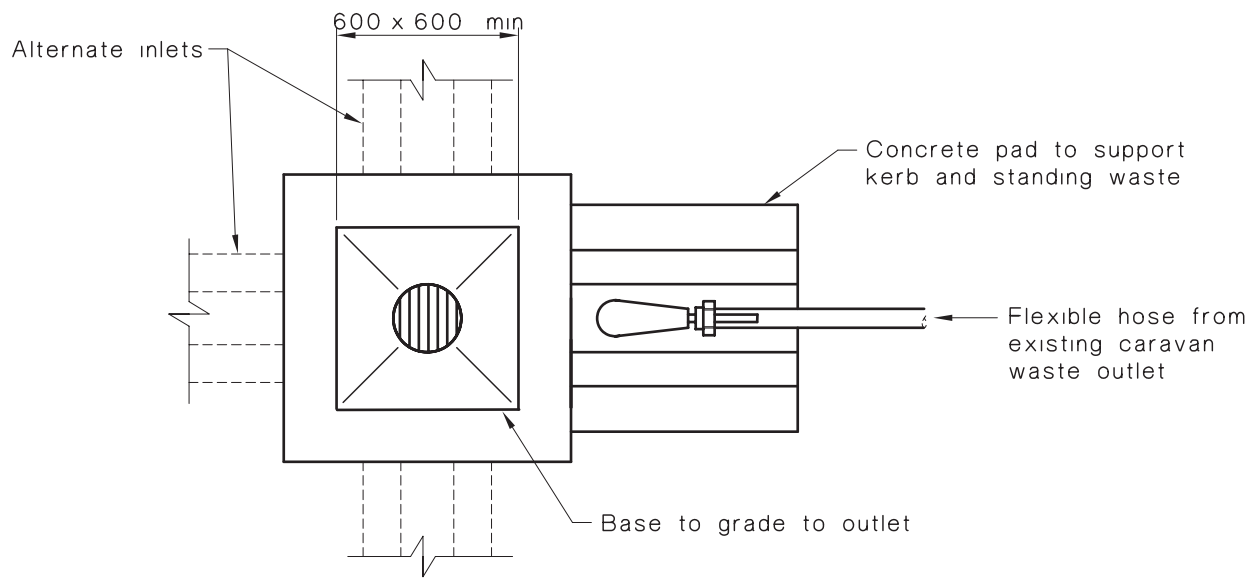
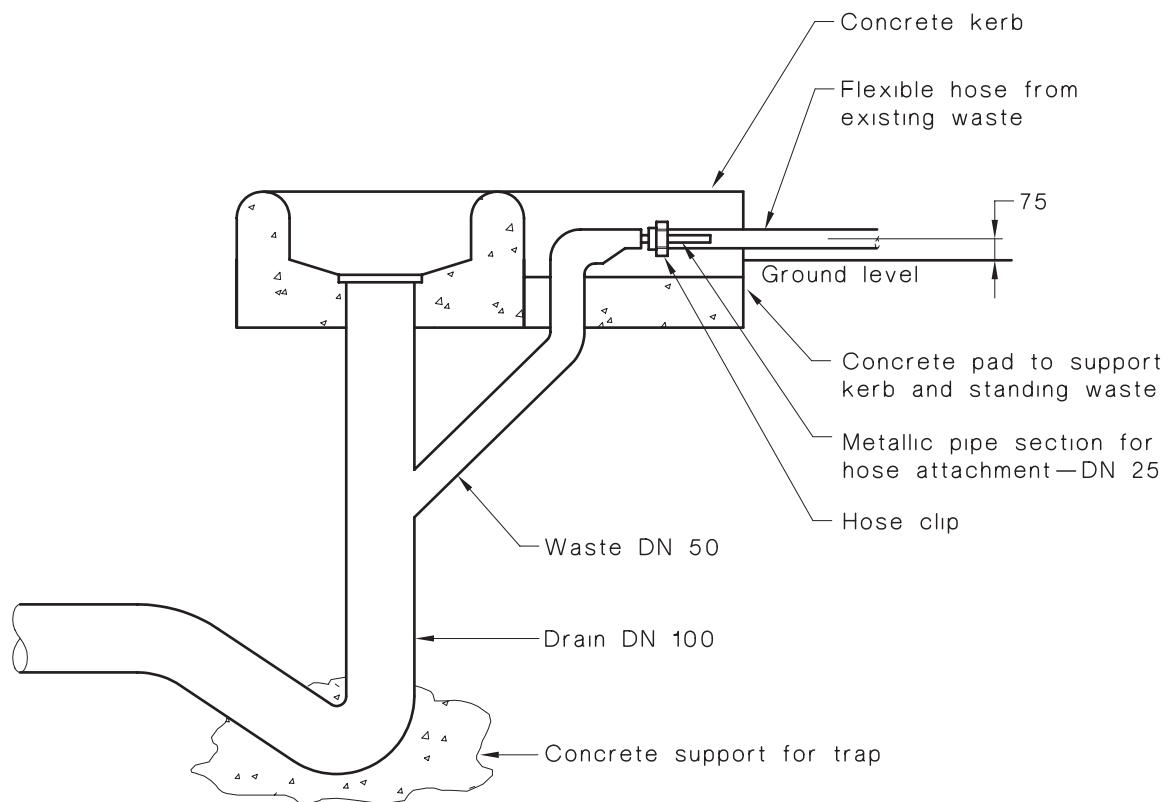


(b) Alternative soil waste dump point

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

DIMENSIONS IN MILLIMETRES

FIGURE 3.6 SOIL DUMP POINTS FOR CARAVAN PARKS

**TOP VIEW****SECTION**

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

DIMENSIONS IN MILLIMETRES

FIGURE 3.7 TYPICAL CARAVAN SULLAGE DUMP POINT

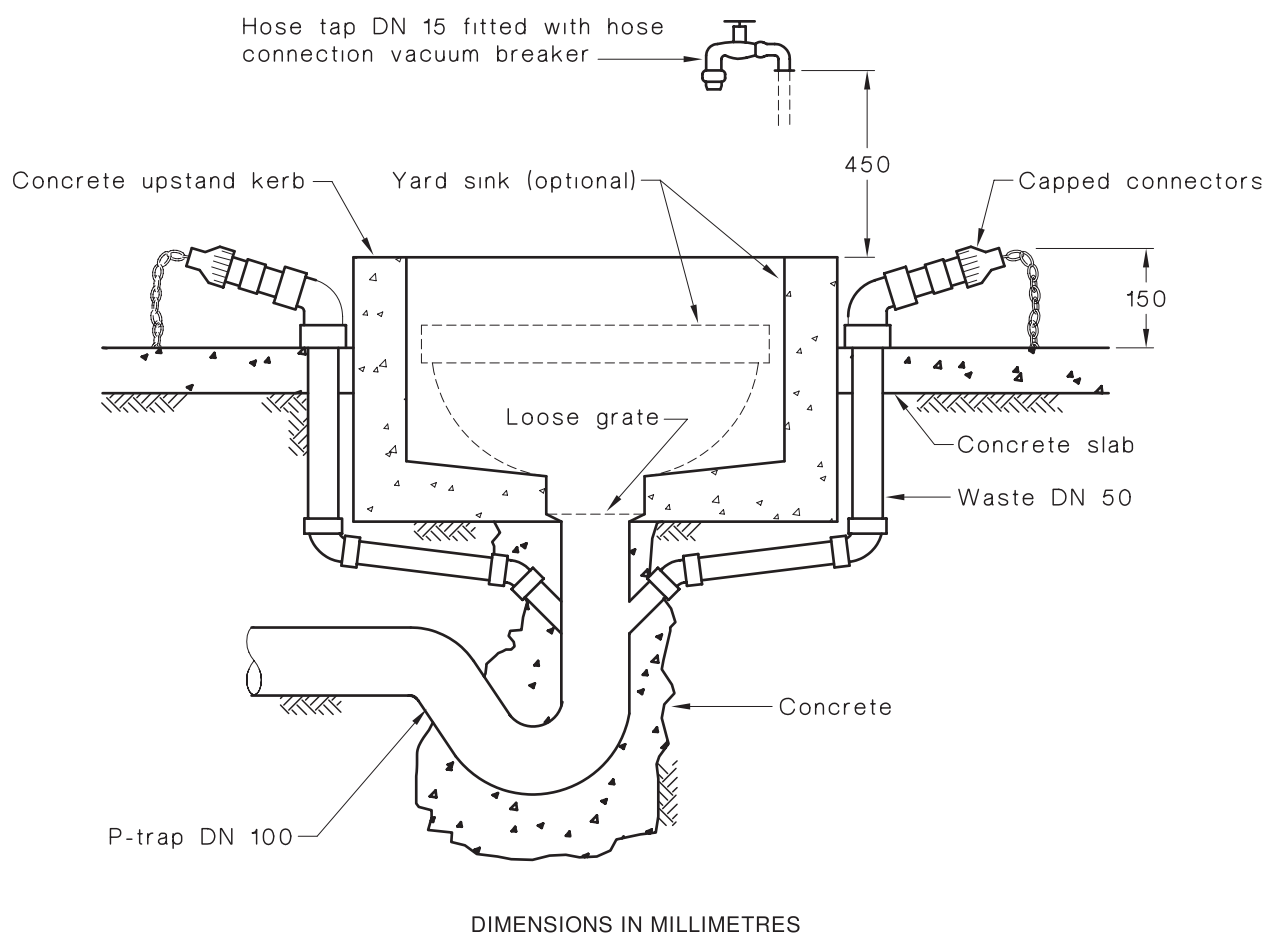


FIGURE 3.8 SULLAGE DUMP POINT FOR CARAVAN PARKS

3.17 COMMON EFFLUENT DRAINAGE SYSTEM

3.17.1 General

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

3.17.2 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 except that cleaners, sinks shall either discharge through a sullage tank, where provided, or directly to the drain from the septic tank to the common effluent drain (see Notes).

Waste fixtures may pass through a sullage tank where it is impractical to discharge through a septic tank due to location and available fall.

- (b) Drains from septic or sullage tanks or cleaners, sinks 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%.
- (c) Air admittance valves shall not be installed on septic tanks. If air admittance valves are installed on an existing installation they shall be removed.

- (d) An inspection shaft shall be provided in accordance with Clause 4.4.3 and may be of the same diameter as the drain.
- (e) Inspection openings shall be provided in accordance with Clause 4.7 and also on —
 - (i) the inlet to the septic tank; and
 - (ii) the outlet of the septic tank, within 2.5 m of the tank, where the connecting drain is greater than 10 m in length.
- (f) Drains, both existing and new, shall be tested in accordance with Section 12.
- (g) Soakage wells stormwater, roofwater and subsoil water drainage shall not be connected to the common effluent drain.

NOTES:

- 1 The discharge from cleaners' sinks may contain concentrated cleaning fluids that are harmful to the biological process within the septic tank and therefore should by-pass the septic tank.
- 2 Typical connections are shown in Figures 3.9 and 3.10.

3.17.3 Septic tanks

Septic tanks, as part of the common effluent drainage system, shall be sized, constructed and installed in accordance with AS 1546 and the regulatory authority's requirements.

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

3.17.4 Sullage tanks

Sullage tanks shall be constructed and installed in accordance with the requirements for septic tanks.

The minimum capacity of a sullage tank for a single dwelling shall be 450 L.

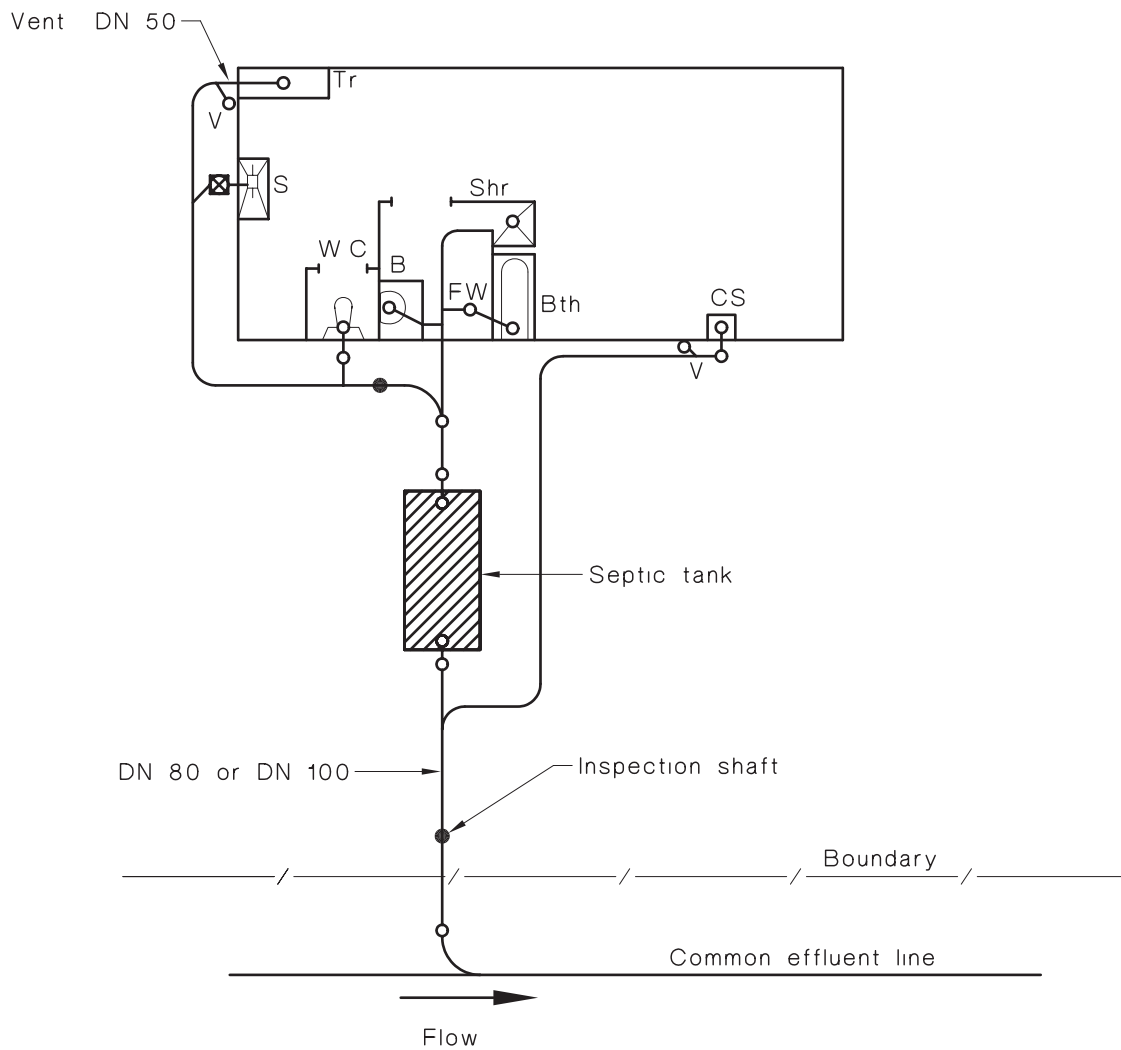
Tanks may be rectangular or circular.

Rectangular tanks shall have a water depth, length and width ratio of approximately 1:1.5:1. Circular tanks shall have a water depth to diameter ratio of 1:1.

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 is used to perform the flushing operation as no direct connection to a town supply is permitted.
- 3 Water closet pans and cisterns installed in connection with common effluent systems should comply with the relevant regulatory authority's requirements.

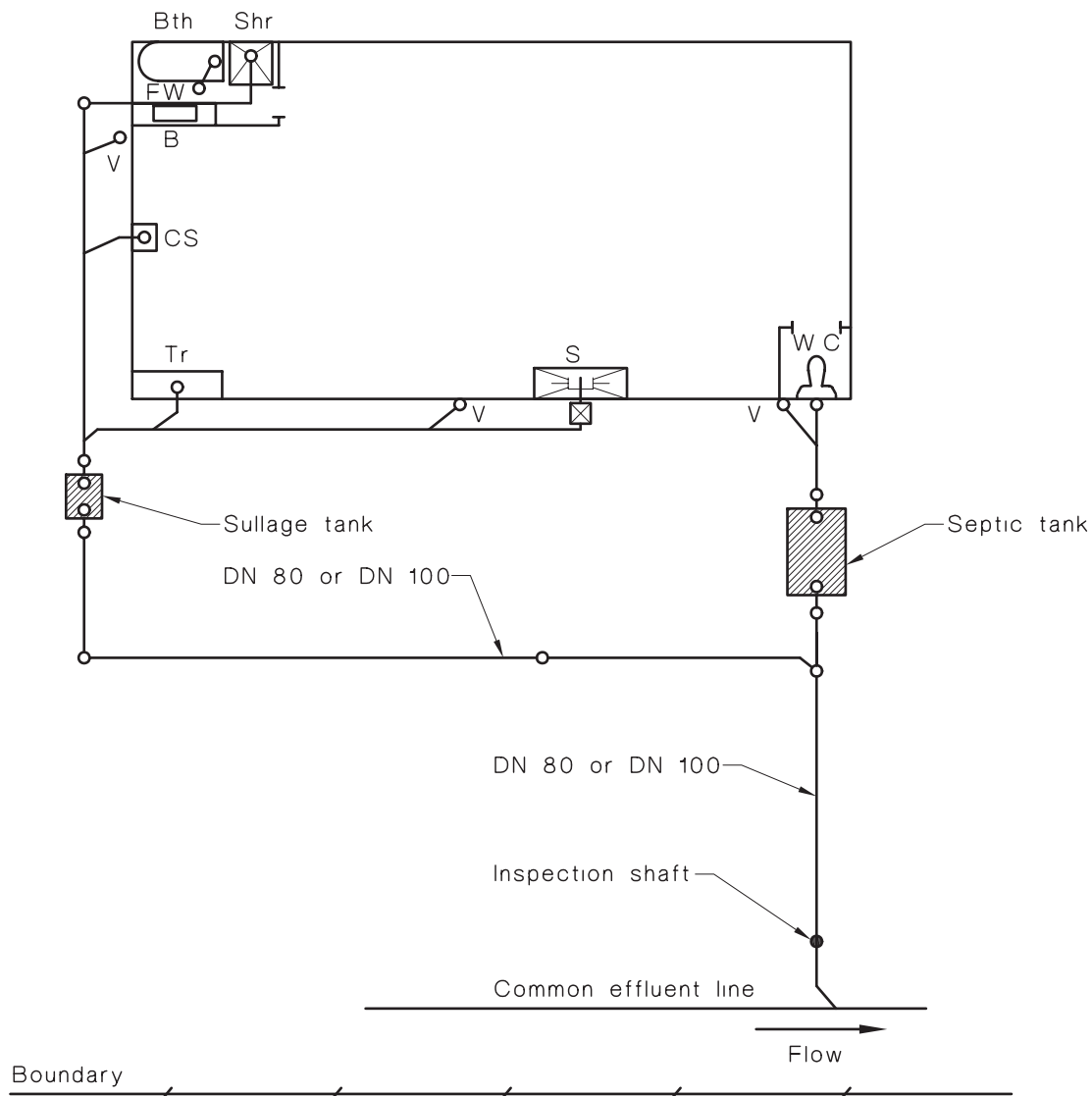


LEGEND

○ = inspection opening
 ☒ = gully
 FW = floor waste
 Tr = trough
 WC = water closet
 S = kitchen sink

Shr = shower
 V = vent
 ● = inspection shaft
 B = basin
 Bth = bath
 CS = cleaner's sink

FIGURE 3.9 TYPICAL CONNECTION OF NEW OR EXISTING INSTALLATION TO COMMON EFFLUENT DRAIN



LEGEND

○ = inspection opening
 ☒ = gulley
 FW = floor waste
 Tr = trough
 W C = water closet
 S = kitchen sink

Shr = shower
 V = gulley
 ● = inspection shaft
 B = basin
 Bth = bath
 CS = cleaner's sink

FIGURE 3.10 TYPICAL CONNECTION OF SEPTIC TANK AND SULLAGE TANK TO COMMON EFFLUENT DRAIN (EXISTING INSTALLATIONS ONLY)

SECTION 4 DRAINAGE SYSTEM

4.1 SCOPE OF SECTION

This Section specifies the requirements for the components of sanitary drainage systems (see Appendix C for maximum length of discharge pipes without venting).

4.2 POINT OF CONNECTION

4.2.1 General

A drain shall connect to the sewer only at a point provided by the regulatory authority and the connection 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 Fixtures installed in basements or other locations, where surcharge could damage the premises and contents, should be connected to the sewerage system by means of a pumping installation.

4.2.2 Protection of sewers

Whenever the ground of any property is opened for any purpose, all measures necessary shall be taken to protect the authority's sewers from damage during the course of any work on the drain 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
- (h) have a jump-up installed to connect drains at different elevations.

4.3.2 Above ground under buildings

Drains may be installed above ground under buildings in accordance with Clause 9.10 and the following:

- (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.

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.

4.4 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 and access provided in accordance with the following:
 - (i) A cast iron 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 in accordance with the following:

- (a) *Under cover* An inspection cap may be installed under a roofed area and 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 other.
- (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 in accordance with the following:
 - (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 fitting or fixture 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 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 which 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 not be 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.

4.5.2 Installation

A reflux valve shall be installed where—

- (a) the minimum height of the overflow relief gully and the lowest fixture specified in Clause 4.6.6.6 cannot be achieved; and
- (b) a fixture is located in a basement and discharges to a sewage ejector or wet well and can be affected by a surcharge from a fixture at a higher level.

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 9.12.2), 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) be supported on a concrete footing of a thickness not less than 100 mm and extending upwards to not less than 100 mm above the base of the gully;
- (c) have the top of the gully riser, if of vitrified clay or UPVC, protected from damage at ground level by means of a concrete surround of a minimum width of 100 mm and a minimum depth of 100 mm below ground level; and
- (d) have each gully riser provided with a grating to relieve surcharge.

4.6.3 Maintenance of water seal

The water seal shall be permanently maintained in the gullies (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 tap located over the gully;
- (d) waste fixtures or waste stacks connected into a gully riser, discharging below the level of the grating and above the surface level of the water seal (see Figure 4.1); or
- (e) the discharge from a charge pipe in accordance with Figure 4.3 and Clause 4.6.8.

TABLE 4.1
CONNECTION OF FIXTURES TO DISCONNECTOR GULLIES

Fixture	Maximum unvented length of waste pipe (Bends to be kept to a minimum), m
Basin or bidet with DN 40 traps and waste pipes	3.5
All other waste fixtures and floor waste gullies with DN 50 or smaller waste pipes	6
Floor waste gullies and fixtures with DN 65 or larger waste pipes	10

4.6.4 Prohibited discharge

Soil fixtures shall connect directly to the sewer drain and not discharge over the water seal of a gully. Surface or roof water shall not discharge into the sewer drain.

4.6.5 Disconnecter gullies inside buildings

A disconnecter gully may be located within a building in accordance with the following:

- (a) The gully riser shall extend to floor level and be sealed with a removable airtight cover.
- (b) A DN 50 vent pipe, branching from the riser pipe or a fitting, shall extend at a grade of not less than 1.25% and terminate with a grating at an external wall of the building at least 75 mm above the ground surface. However, areas affected by flooding shall comply with Clause 4.6.6.8.
- (c) 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 6.7.4.
- (d) Fixtures or appliances shall not be connected to the vent pipe.

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. Disconnecter gullies complying with the requirements of Clauses 4.6.6.3 to 4.6.6.7 are acceptable as overflow relief gullies.

4.6.6.2 Permitted omission

An overflow relief gully may be omitted as follows:

- (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. However, the fixtures on the ground floor shall 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.

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.

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.

TABLE 4.2
SIZE OF OVERFLOW RELIEF GULLIES

Size of main drain DN	Size of gully outlet DN
100 and 150	100
>150	150

4.6.6.5 *Alternative locations*

Where it is not possible to comply with Clause 4.6.6.4, an overflow gully may be—

- (a) recessed within an external wall in accordance with the following (see Figure 4.1(b)):
 - (i) The recess shall be not less than 300 mm wide and 600 mm high measured above the top of the gully riser, and shall be watertight.
 - (ii) The gully riser shall be fully accessible.
 - (iii) The base of the recess shall be graded away from the building; or
- (b) located within a building in accordance with the following (see Figure 4.1(a)):
 - (i) The gully riser shall extend to floor level and be sealed with a removable airtight cover.
 - (ii) An overflow pipe of the same size as the gully riser shall be installed at a grade of not less than 1.25% and terminate in the open air at an external wall of the building in accordance with Clauses 4.6.6.6 and 4.6.6.7. However, areas affected by flooding shall comply with Clause 4.6.6.8.
 - (iii) The overflow pipe shall be provided with a perforated removable or hinged cover that shall not restrict discharge under surcharge conditions.
 - (iv) Fixtures or appliances shall not be 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) such gullies need not comply with the requirements of Clause 4.6.6.6.

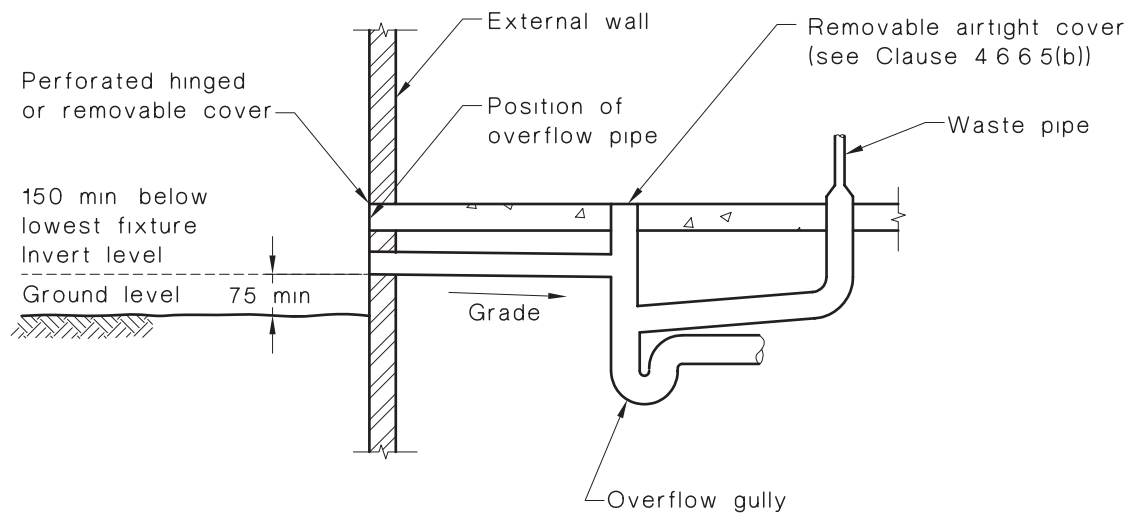
4.6.6.6 *Height below lowest fixture*

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.

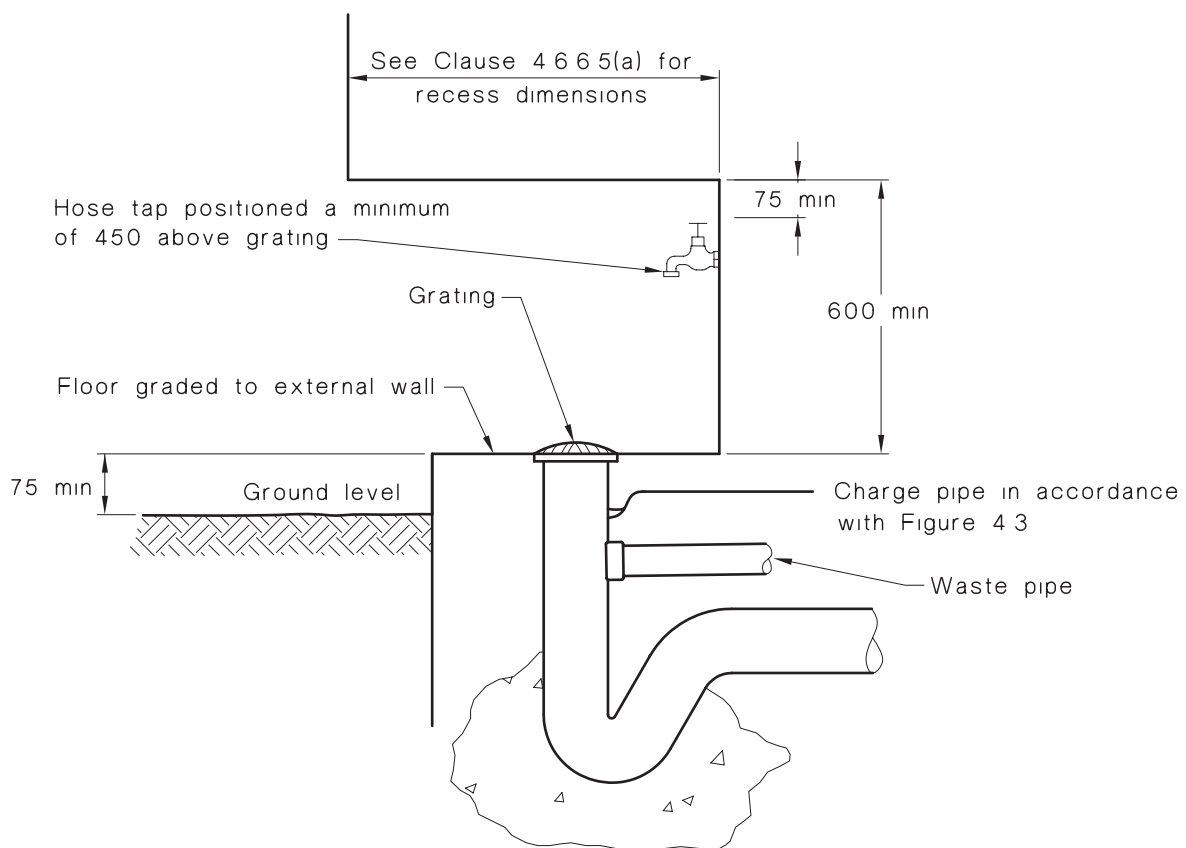
This height shall be measured vertically from the overflow level of the gully riser, or from the invert level of the overflow pipe, to the appropriate point given in Table 4.3.

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 surrounding ground 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.



(a) Typical detail of overflow relief gully inside building



(b) Typical detail of overflow relief gully inside building

DIMENSIONS IN MILLIMETRES

FIGURE 4.1 POSITIONING OF OVERFLOW RELIEF GULLY

TABLE 4.3
POINT OF MEASUREMENT ON FIXTURES FOR HEIGHT
ABOVE OVERFLOW GULLY

Fixture	Point of measurement
Soil fixture with an integral trap	Top surface level of the water seal
Floor waste gully or shower	Top surface level of the grate
Soil fixture located in an outbuilding or room, the flow of which is graded to an external doorway	Overflow rim of the fixture
Other fixtures	Top surface level of the fixture outlet

NOTE: Floor waste gullies (including those in shower areas) that have a non-return valve fitted to prevent backflow may be excluded.

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 the adopted 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 adopted flood level and in accordance with Clause 4.6.6.6.

No property shall gravitate to the authority's sewer where the above requirements cannot be achieved.

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 that are permitted to discharge to floor waste gullies shall be as given in Table 4.4 and, except for tundish discharges, 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.

4.6.7.3 *Connection of fixtures*

With the exception of fixture pairs, each fixture shall be connected to a floor waste gully by an individual waste pipe at a grade of not less than 2.5%.

Waste pipes shall not exceed the lengths specified in Table 4.4.

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

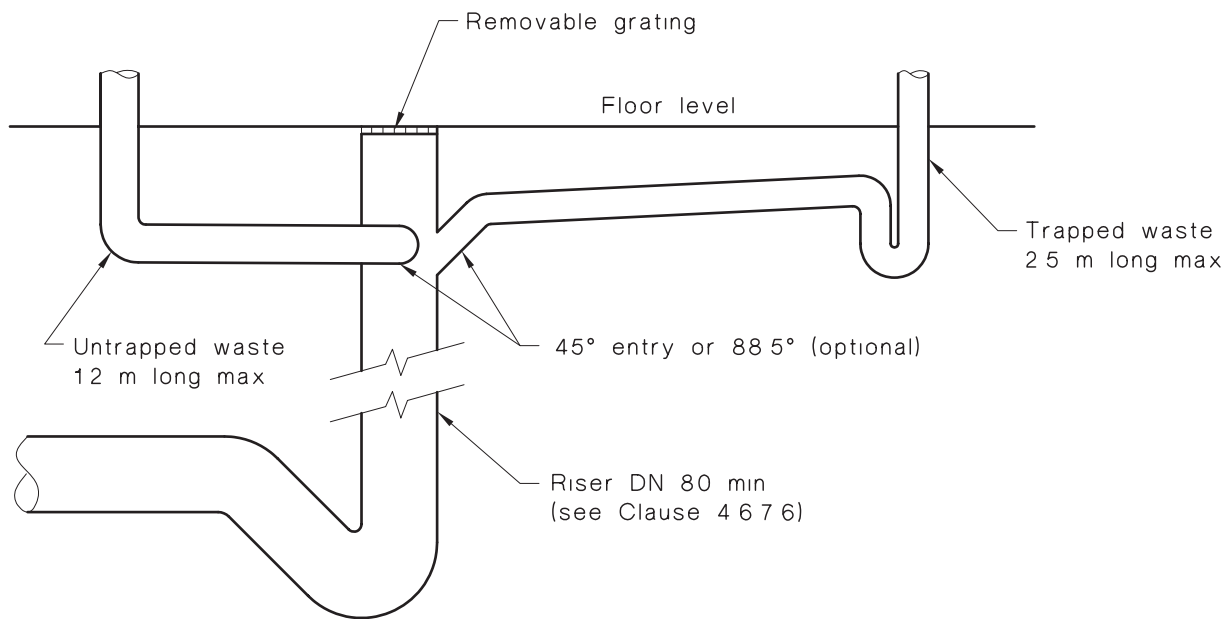
Wastepipes discharging to FWGs shall not be extended and trap vents shall not be installed on fixture discharge pipes.

4.6.7.5 *Prohibited location*

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

4.6.7.6 *Removable grate*

Floor waste gullies shall be installed with an accessible removable grate and a riser not less than DN 80 at floor surface level, except that if the sole function of the floor waste gully is to dispose of water spillage and washdown water, a DN 50 outlet and riser may be used.



NOTE: See Table 4.5 for minimum riser heights.

FIGURE 4.2 TYPICAL CONNECTION OF WASTES TO A FLOOR WASTE GULLY

TABLE 4.4
DISCHARGE TO FLOOR WASTE GULLIES

Waste fixture connected to gully riser	Maximum length of waste pipe, m	
	Untrapped fixture	Trapped fixture
Basin, drinking fountain	Not permitted	2.5
Bath, shower/bath	1.2	2.5
Cleaners' sink, ablution trough	1.2	2.5
Bar sink, clothes-washing machine, glass-washing machine	1.2	2.5
Shower	1.2	2.5
Bain-marie, refrigerated cabinet, sterilizer (see Section 11)	1.2	2.5
Laundry tub	1.2	2.5

NOTE: Where foaming is likely to cause a problem, fixtures should not discharge through a floor waste gully

4.6.7.7 Height of gully riser

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

- The minimum height shall comply with Table 4.5.

- (b) The maximum height shall be 600 mm when receiving discharges from fixtures as shown in Table 4.5.
- (c) The maximum height may extend to 1 m when receiving the discharges from plant rooms located above groundfloor level.

4.6.7.8 Discharges from tundishes

- ^{A1} In addition to the discharges permitted in Table 4.4, tundishes receiving discharges from water heater drains, air conditioning units, other condensate lines and the like, may discharge to a floor waste gully. The maximum length of the discharge pipe shall not exceed 10 m (see Figure 4.3(a)).

TABLE 4.5
MINIMUM HEIGHT OF FLOOR WASTE GULLY RISERS

Waste fixtures connected to gully riser	Size of gully riser DN	Minimum height (water seal to floor level)	
		88½° entry	45° entry
All permitted waste fixtures including maximum one bath	80	200	150
	100	150	100

4.6.7.9 Size of gully trap outlet

The minimum size of floor waste gully trap outlets shall be as specified in Table 4.6.

4.6.7.10 Connection of waste pipes

Individual waste pipes connecting into the riser of a floor waste gully shall enter the riser at an angle between 45° and 88½°, as close as possible to but above the level of the water seal.

4.6.7.11 Size of waste pipes from fixtures

The size of waste pipes from fixtures, connecting into floor waste gullies shall be as given in Table 6.1.

TABLE 4.6
FLOOR WASTE GULLY OUTLET SIZE

Maximum number of fixture units discharging into gully trap	Minimum nominal size of outlet DN
3	50
10 (including the discharge from not more than one bath)	65
>10	80

NOTE: Shower outlets may be used as floor waste gullies.

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 the following:

- (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 from a mechanical trap priming device extended to floor drain within the same room or compartment (see Figure 4.3(c)).

A1 (d) A lock shield (shrouded) hose tap installed in the same room, and with a graded floor

A1 4.6.8.2 *Installation*

The charge pipe shall be in the size range of DN6 to DN15

- (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 charge pipe to the floor gully should be installed so as not to impede access for maintenance.

4.7 INSPECTION OPENINGS (IO)

A1 4.7.1 *Location*

4.7.1.1 *General*

The location of inspection openings in drains shall be in accordance with Clauses 4.7.1.2 and 4.7.1.3.

4.7.1.2 *Australian requirements*

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

- (a) as close as practical outside the building on each branch connecting one or more water closets or slop hoppers but not greater than 2.5 m;
- (b) at each interval of not more than 30 m, except where waste fixtures only are connected;
- (c) at the connection to the regulating authority's sewer, if not provided by the authority;
- (d) on the downstream end where any drain passes under a building except where waste fixtures only are connected;
- (e) where any new section of drain is connected to an existing drain; and
- (f) immediately at or upstream of the upper bend of a jump-up.

4.7.1.3 *New Zealand requirements*

Inspection openings or other means of access for maintenance shall be provided in accordance with NZBC G13/AS2.

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.