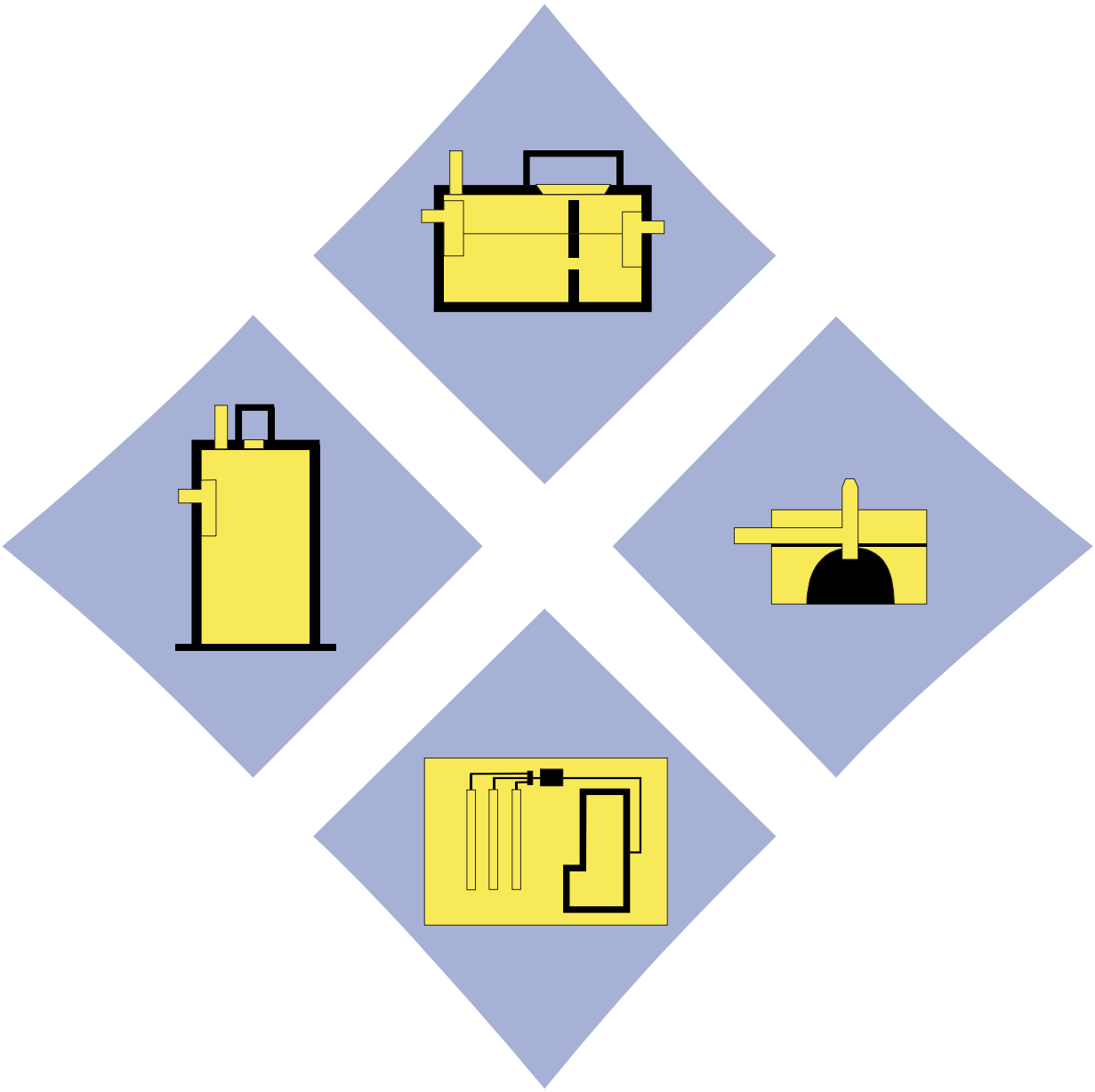
Waste Control Systems

STANDARD FOR THE CONSTRUCTION, INSTALLATION AND OPERATION OF SEPTIC TANK SYSTEMS IN SOUTH AUSTRALIA



SOUTH AUSTRALIAN HEALTH COMMISSION

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FOREWORD

In July 1993 the Public and Environmental Health Act was amended to prescribe standards to be observed in installing and operating *Waste Control Systems*. The powers of the Act cover the setting of fees and regulation of construction, installation, operation, alteration and maintenance of such systems.

The Waste Control Regulations under the Public and Environmental Health Act have been framed to enable administration by Local Government of waste control systems covered by a prescribed code, with the SA Health Commission retaining the standard setting role, administration in districts outside of local government areas, and the approval of products and non standard systems.

Waste Control Regulation 4 prescribes codes to be read in conjunction with the regulations.

This Code details the technical aspects to be considered in the planning stages of a waste control system (septic tank system) and sets out the requirements relating to applying for approval, and for the installation and operation of systems.

The information has been prepared to assist the relevant administering authorities in their respective roles as well as providing advice for consultants, for plumbers and drainers, for builders, and for owners and/or occupants of premises on the design, installation and operation of septic tank systems.

The Code advises of the need to take into account the requirements of other agencies to ensure that the installation and operation of the waste control system does not have an adverse environmental impact.

The information in this Code requires interpretation. It seeks overall to achieve an acceptable end result, that is, the design of a septic tank system to serve the specific requirements of the premises without creating nuisance or risk to health.

This Code needs to be read in conjunction with the Waste Control Regulations and other appropriate prescribed codes and/or Supplements to this Code.

In accordance with Waste Control Regulation 4 this Code is a prescribed code. Non compliance with its provisions is deemed to be an offence under Regulations 23 and 26 and the relevant authority may institute legal proceedings.

CONTENTS

CONTENTS (cont.)

TABLE OF FIGURES

GLOSSARY OF TERMS

Aerobic bacteria: Bacteria that grow in the presence of oxygen.

All waste septic tank: A tank receiving the discharge of sewage and sullage wastes from sanitary fixtures including a water closet, bath, basin, shower, laundry trough, washing machine, kitchen sink and similar plumbing fixtures.

Anaerobic bacteria: Bacteria that grow in the absence of oxygen.

Approve/approved/ approval: Includes a written endorsement, authorisation or consent issued by the relevant authority and it may be subject to conditions and or as otherwise indicated in the Public and Environmental Health (Waste Control) Regulations.

AS: Australian Standard (latest version).

Biomass: A film of biological matter on the contact surface of the soil in a soakage system.

Building: A building as classified under the Development Act provisions; or building work requiring Development Act approval; or as defined in the Public and Environmental Health Act

Daily in flow: The volume in litres of sewage and liquid wastes flowing into a septic tank during a 24 hours period, see also *hydraulic loading*.

Desludging: Removal of the accumulated sludge and scum from the septic tank.

DN100: Is the nominal pipe diameter in millimetres.

Domestic residential premises: Includes single domestic dwellings, flats, units, townhouses, retirement villages (no communal food service areas) and like premises.

Drain: An underground pipe for conveying sewage and liquid wastes to the septic tank.

Effluent: The treated liquid leaving the septic tank.

Effluent disposal system: A constructed system utilising various methods and materials to effectively dispose of septic tank effluent.

Friable soil: Soil that is easily crumbled and consists predominantly of sand and loam.

Hydraulic loading: Liquid flow required to be handled by the treatment process, see also *daily in flow*.

GLOSSARY OF TERMS (cont.)

Multiple occupancy residential premises: More than one residential dwelling unit or flat constructed on one or more allotments and discharging into a common or multiple septic tank system/s and generally under one or more Titles.

Non domestic residential premises: Includes nursing homes, rest homes, retirement villages with communal food service areas, hotels, motels, lodging houses, camps, hospitals, institutional facilities and like premises.

Percolation: Movement of water into the soil.

Perforated pipe soakage trench: A subsurface soakage system using perforated pipe to convey the effluent along a trench.

Plastic tunnel soakage trench: A subsurface soakage system using sections of plastic tunnel to form an underground soakage trench.

Primary treatment: Is the treatment of sewage that occurs in the septic tank compartment/s of a waste control system.

Relevant authority:

- is the local council where the proposed septic tank system is to be installed in an area subject to local government control,
- is the SA Health Commission where the installation of a septic tank system is in an area not subject to local government control; or the installation is for the local council; or the proposed system is of a kind not covered by a SA Health Commission Code/Standard,
- is the SA Health Commission where approval is required for the manufacture, supply or installation of a waste control system, appliance, equipment, product or process within South Australia.

Reticulated water: Any water supply obtained from a reticulated system and includes any bore, river or dam water supply.

SAHC: South Australian Health Commission.

Sanitary fixtures: The plumbing fixtures connected to the system including a bath, basin, clothes and dishwashing machines, food waste disposal unit, kitchen sink, laundry trough, spa bath, toilet and other sanitary fixtures as permitted by AS 3500-2.

Sanitary napkins: Includes any disposal napkin, nappy liners, incontinence pads/ dressings/liners/pants, tampons, sanitary pads/napkins or similar articles used for collecting or containing body discharges.

Scum: Material floating on the surface of the septic tank. Scum usually contains fats, oils and greases.

GLOSSARY OF TERMS (cont.)

Septic tank system: Includes the sanitary plumbing fixtures, traps, waste pipes, vents, inspection openings, drains, septic tank and/or other treatment units and methods of effluent disposal.

Sludge: Solids which have settled to the bottom of the septic tank.

Soakage bed system: A subsurface soakage system using sections of plastic tunnel or perforated pipe in a bed configuration.

Soil permeability: Capability of a soil to allow water to percolate.

STEDS: A Septic Tank Effluent Disposal Scheme is a communal drainage system, for the carriage of septic tank effluent and sullage water, owned and maintained by the local council or relevant authority/body.

Subsurface soakage: A trench, bed, well or pipe system from which effluent percolates into the soil.

Suspended solids: Solid particles held in suspension including settleable and non-settleable matter.

Waste control system: As defined by the Public and Environmental Health Act and includes any system providing for the collection, treatment or disposal of human, commercial or industrial wastes in solid or liquid form incorporating biological, chemical or artificial means and fixtures, fitting, appliances, plant, processes associated with such a system.

Wastewater: Water which is collected and transported through waste pipes and sewers. Wastewater normally includes water from domestic, commercial and industrial sources.

WC only system: A septic tank system receiving the discharge from a water closet and may include connection of a hand basin.

1 INTRODUCTION

The safe disposal of sewage and household wastewater is necessary to safeguard the health of the community and protect the environment.

Where connection to a reticulated sewerage system is not practicable, installation of a waste control system incorporating a septic tank is an acceptable alternative, providing site conditions are suitable for this method of sewage disposal.

Not all sites have characteristics suitable for conventional subsurface effluent disposal; therefore, it is very important to carry out the necessary investigations to determine the suitability of the site and design the system accordingly.

Where site conditions are not satisfactory for subsurface disposal it will be necessary to consider an alternative disposal system, such as surface irrigation or off-site disposal.

NOTE: *It is important that the requirements of the septic tank system be considered during the planning stage of any development.*

Approval must be obtained from the relevant authority, refer to Chapter 3 for details, before proceeding with the installation of a septic tank system.

This Standard has been compiled to provide information on conventional septic tank systems incorporating subsurface effluent disposal.

2 INFORMATION & ENQUIRIES

Advice on the installation of septic tanks may be obtained from the following locations:

(1) The LOCAL COUNCIL OFFICE for the council area in which the system is to be installed,

or

(2) If the system is to be installed in an area that is NOT under local government control:

SOUTH AUSTRALIAN HEALTH COMMISSION
8th Floor
Adelaide Citi Centre
11 - 13 Hindmarsh Square
Adelaide SA 5000

Postal Address:

PO Box 6, Rundle Mall SA 5000

Telephone Enquiries: (08) 226 6530

3 LEGAL REQUIREMENTS

3.1 Public and Environmental Health (Waste Control) Regulations

The Public and Environmental Health (Waste Control) Regulations detail the legislative requirements to be satisfied with regard to the manufacture, installation and operation of Waste Control Systems.

REGULATION 6 defines the relevant authority and their respective areas of administration.

REGULATION 7 provides that;

> A person must not install or alter a waste control system except as approved by the relevant authority.

REGULATION 9 provides that;

> A person must not manufacture or construct a waste control system or a component, part or product for a waste control system except as approved by the relevant authority.

REGULATION 10 provides that;

> A person must not sell, or expose for sale, or have in his or her possession for the purpose of sale a waste control system unless it has been manufactured or constructed under an approval from the relevant authority.

REGULATION 11 provides that;

> A person must not use a waste control system except as approved by the relevant authority.

REGULATION 12 provides that;

(1) The application:

- be on a form determined by the SA Health Commission,
- contain the required information as detailed on the form and as set out in the relevant code and be accompanied by the required plans,
- include such other data as required by the relevant authority,
- be accompanied by the required fee.

(2) Penalties apply for false or misleading information.

REGULATION 13 (3) provides that;

> The applicant, owner or the occupier of the premises are obliged to ensure the waste control system complies with the approval conditions at all times.

Penalties apply for non compliance with the relevant regulations.

3.2 Application to install a septic tank

Prior to installing a septic tank system it is necessary to submit an application to and receive an approval from the relevant authority.

The relevant authority is:

> The local council for the area in which the system is to be installed, *or*
>
> The South Australian Health Commission for areas of the State not under local government control.

Application for approval to install a septic tank system must be made on the required application form and provide the necessary information. The application form can be obtained from the relevant authority.

3.3 Information to be provided with the application

APPLICATION FORM

The application form requires completion of the sections relating to the following:

- location of the installation,
- owner/applicant,
- premises and system,
- non standard fixtures,
- septic tank,
- land capability assessment,
- disposal method,
- declaration and signatures.

To assist with the identification of the site the application details should include the following information:

- *where situated with a defined suburb or township*:
  provide street number, and/or allotment number, street name, suburb or township,
- *where situated within a rural area*:
  provide hundred, section, allotment number, name of road, name of township or district,
- *where the location of the installation is not within a defined township*:
  provide clear directions and a location plan,
- *the site must be identified*:
  provide a sign positioned at the front of the allotment, showing the owner's name and the allotment number.

NOTE: *(1) Applications not signed by the OWNER will be returned for the appropriate endorsement.*

(2) Before proceeding with the preparation of an application to install a septic tank system, preliminary assessment of the site is necessary. Refer to Section 7.2 "Site Assessment Criteria" of this Standard.

(3) Failure to satisfy the requirements in Section 7.2 "Site Assessment Criteria" of this Standard may necessitate:

- *additional disposal system requirements,*
- *consideration of alternative treatment and or disposal methods.*

It is the applicant's responsibility to ensure that the installation of the septic tank system is in accordance with the approved plan and approval conditions. For this reason the owner should when possible be the applicant. Refer to the comment on Regulation 13 (3) in Section 3.1 of this Chapter.

NOTE: *Work on the installation of a septic tank system should not commence until copies of the "approved plan and approval conditions" have been received by the applicant. Installation of the system without approval may result in action by the relevant authority.*

SITE LAYOUT PLAN

A detailed site layout plan must be provided (in duplicate) drawn to a scale of 1 in 500 showing:

- block dimensions,
- contours indicating natural ground fall,
- proposed location of the building and all other structures including sheds, swimming pools and paving,
- position of the proposed septic tank, pump sump, distribution sump and effluent disposal system, including distances from boundaries, buildings etc.,
- location of any building on the boundary alignment,
- details of any site modifications e.g. benching, cutting and filling,
- details and location of any diversion trenches to collect surface or migrating subsurface water,
- details and location of storm, surface and roof water disposal,
- details of any well, bore or dam used or likely to be used for human and/or domestic use,
- details of any water source used for agricultural, aquacultural or stock purposes,
- details of any water course, identified on a current 1:50 000 Department of Environment and Natural Resources topographic map, used or likely to be used for human and/or domestic purposes,
- type of proposed septic tank - e.g. precast or constructed in situ,
- capacity of the proposed septic tank and/or pump sump,
- method of effluent disposal,
- full details of the disposal system including length, width and depth,
- depth from surface level to the top of the nominated method of effluent disposal,
- where connection to a septic tank effluent disposal scheme is available, show the line of drain and the connection point. Details on the connection location and requirements can be obtained from the local council office or the relevant authority.

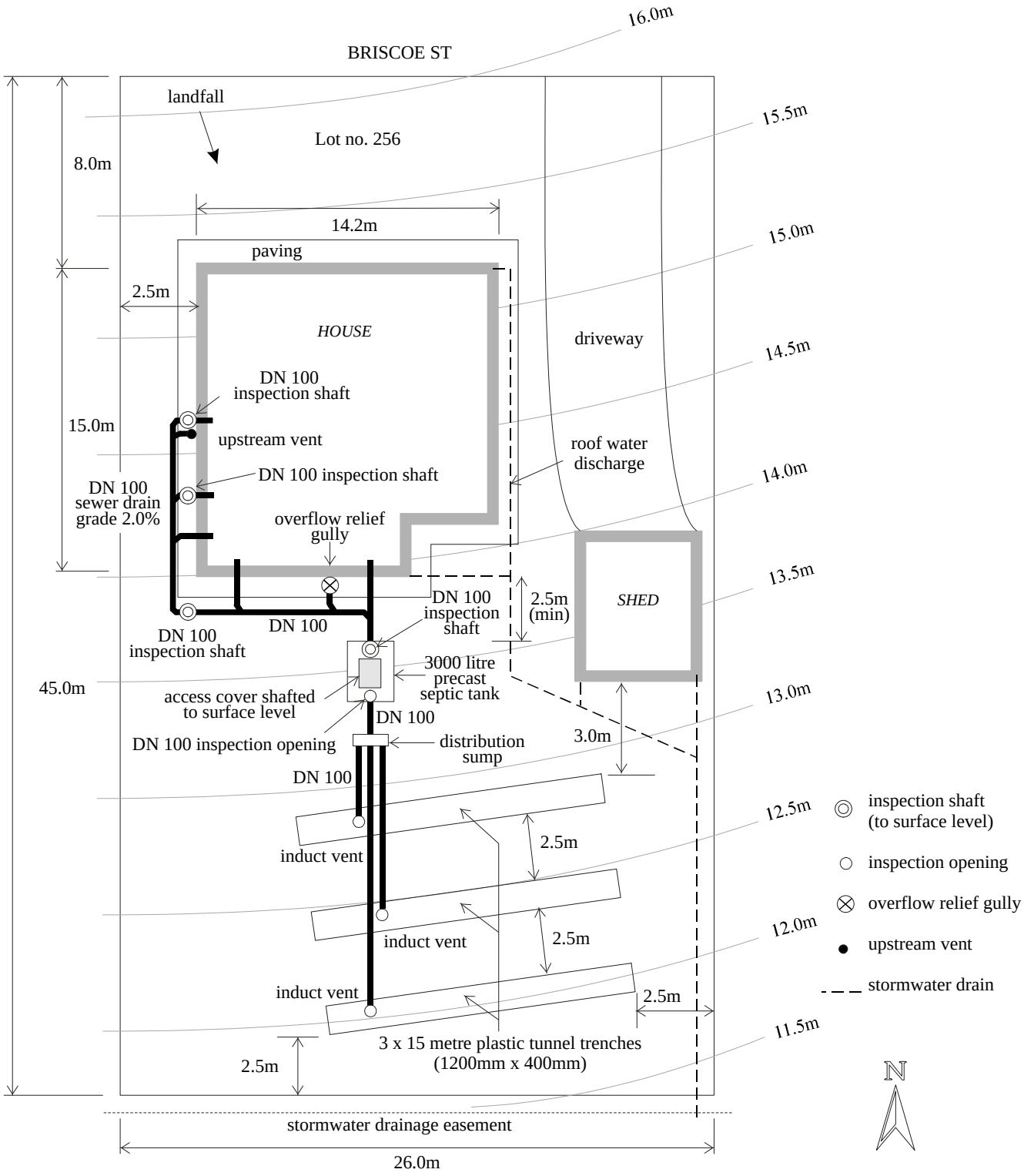
BUILDING LAYOUT PLAN

A detailed building layout plan must be provided (in duplicate) drawn to a scale of 1 in 100 showing:

- the position and description of all the sanitary fixtures to be connected to the septic tank - e.g. water closet pan, basin, bath, shower, laundry trough, washing machine, kitchen sink, dishwasher, food waste disposal unit and spa bath together with its capacity,
- method of connecting the fixtures to the drainage system - including location of the sewer drain, inspection openings, and inspection shafts, junctions and bends, size and grade of sewer drain, position and size of traps (sanitary fixture, floor waste and overflow relief gully), vents and waste pipes,
- the intended use of the building - e.g. house, flats, units, office, shop, hotel etc.,
- the intended use of the rooms within the building - e.g. bedroom, kitchen, family, office, consulting room, dining, bar etc.,
- for non-residential buildings - e.g. offices, shops, hotels, hospitals etc. - it is necessary to state the maximum number of persons using the system. Refer to Chapter 11 - *Table 1* of this Standard for specific requirements.

Figures 1 and 2 show typical site and building layout plans.

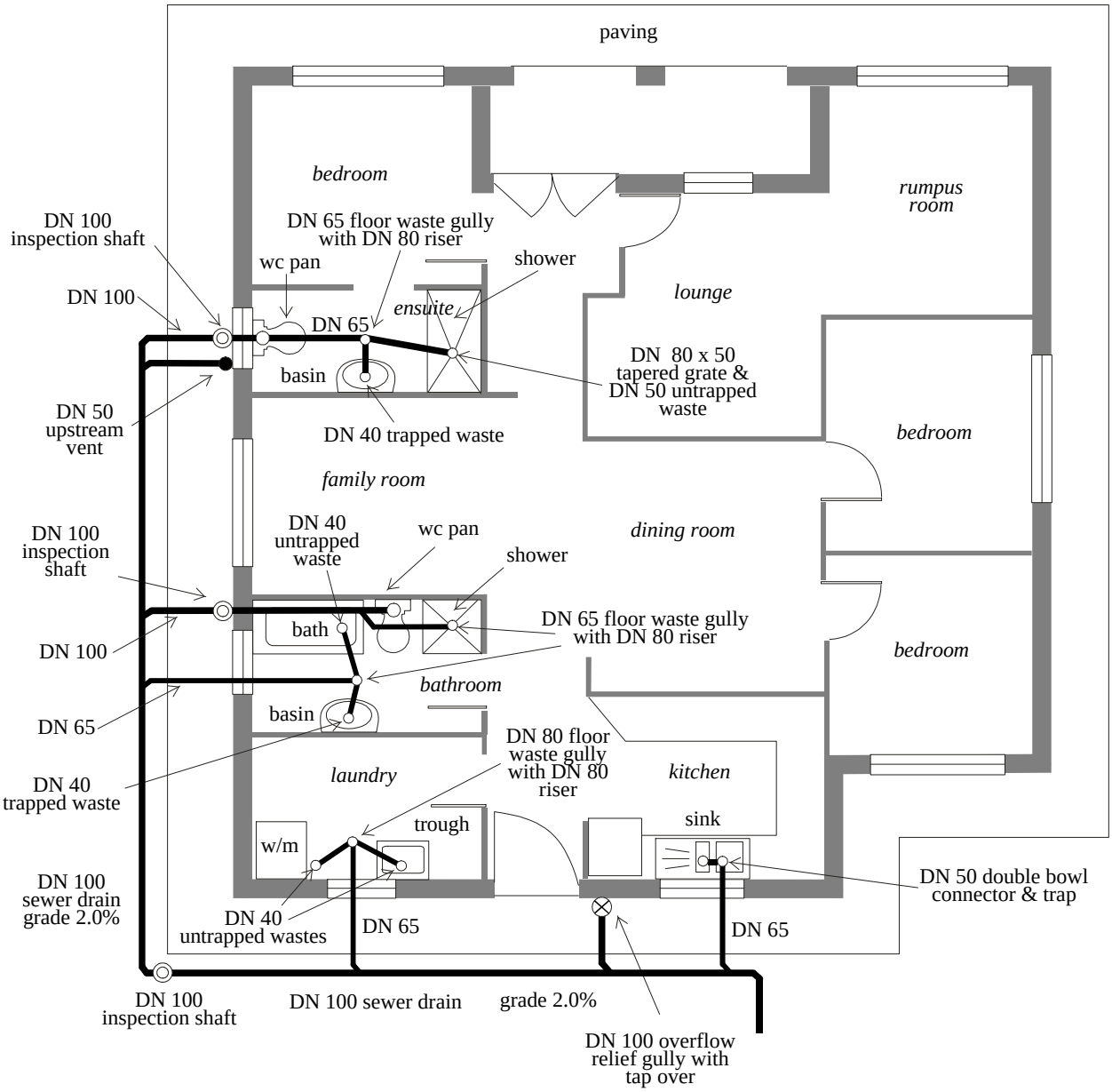
Applicants should note that where the application or plans show insufficient details, delays in approval may result.



To be drawn to a scale of 1:500

FIGURE 1: TYPICAL SITE LAYOUT PLAN

(schematic & reduced for printing)



To be drawn to a scale of 1:100

FIGURE 2: BUILDING LAYOUT PLAN

(Schematic & reduced for printing)

The applicant/owner is required to provide geotechnical evidence demonstrating that the nominated disposal area satisfies the requirements contained in Chapter 7 "The Effluent Disposal System" of this Standard.

This includes:

- general site assessment,
- examination of soil characteristics,
- determination of soil permeability by either the indirect or direct method.

NOTE: *Evidence of site capability is not required where the effluent is to be disposed of off-site e.g. connection to a septic tank effluent disposal scheme.*

DETAIL TO DETERMINE SUBSURFACE DISPOSAL REQUIREMENTS

Details must be provided to enable the determination of subsurface disposal requirements including the type of water supply. Refer to Chapter 7.3.2 *For Single and Multiple Residential Dwelling*s of this Standard for details.

3.4 Waste Control System Fees

A fee, payable to the relevant authority, is required to accompany each application for approval to install or vary a waste control system (septic tank). The fee covers the examination, approval and subsequent inspections of the installed system. An additional fee is required for each septic tank.

As the fee is determined by a range of factors it is necessary to contact the relevant authority who will calculate the fee according to the system capacity and design.

Provisions exist for the relevant authority to vary or remit part of the fee, therefore, it is advisable to contact the relevant authority to determine the fee payable.

NOTE*:* *(1) Failure to submit the correct fee may delay processing of the application.*
(2) The relevant authority may require an additional fee where a split system is installed and the sullage wastewaters from the sanitary fixtures are not processed through a septic tank.

3.5 Approval

Applications will be assessed and where applicable site inspections will be carried out prior to approval being granted. Approval is granted subject to all the work being correctly installed by a competent tradesperson in compliance with the requirements of the relevant authority and including:

- information submitted with the application,
- any notation shown on the plans forming part of the approval,
- details outlined in the installation detail sheet and other attachments,
- the general requirements for septic tank installations as detailed in this Standard and/or applicable supplements,
- the general requirements for plumbing and drainage as detailed in the National Plumbing Code - AS 3500 Part 2, *Sanitary Plumbing and Sanitary Drainage* and any SA Health Commission prescribed exclusions and/or modifications.

The work must not be varied from that shown on the approved plan and attachments without prior written approval from the relevant authority. This may require submission of amended plans appropriately endorsed by the owner.

Approval of applications submitted with insufficient or incorrect information will be withheld until the required details are provided.

NOTE: *Persons installing a septic tank system without approval may be liable to prosecution.*

3.6 Inspection

Inspection of the system may be made either during installation or upon completion. Where regular inspections are made, the work must be inspected before covering/backfilling. Specific details relating to this matter will be shown on the installation detail sheet forming part of the approval.

When calling for an inspection or making enquiries relating to the septic tank installation please quote the reference number shown on the approval documents.

3.7 Testing

Water testing of the drains and the underfloor plumbing is required and must be carried out before covering/backfilling.

3.8 Other Acts & Regulations

Persons installing a septic tank system must ensure that the requirements of other regulatory authorities are complied with. The following legislation may be applicable:

- *Development Act and Regulations including the Building Code of Australia,*
- *Environment Protection Act and Regulations,*
- *Water Resources Act and Regulations,*
- *Sewer Act and Regulations,*
- *Occupational Health, Safety and Welfare Act and Regulations,*
- *Local Government Act and Regulations,*
- *Waterworks Act and Regulations,*
- *Council By-Laws,*
- *SAHC and Council requirements for connection to a Septic Tank Effluent Disposal Scheme (STEDS).*

Electrical connections to plumbing fixtures, pumps etc. shall comply with the requirements of the Supply Authority Service Rules and AS 3000 SAA Wiring Rules.

Persons installing septic tank systems or associated plumbing and drainage for a fee or reward are subject to the provisions of the *Builder's Licensing Act* and should contact the Business and Occupational Licensing Branch of the Office of Consumer and Business Affairs to determine which Builder's Licences they require.

Work on the installation of a waste control system (septic tank) may be carried out by any competent tradesperson, provided that approval has been obtained from the relevant authority and the work meets the required standard and is in accordance with the approval conditions.

4 PLUMBING & DRAINAGE

The essentials of good plumbing and drainage are simple design, sound materials and good workmanship. All materials, fittings and fixtures used must be of a standard approved for sanitary plumbing and drainage.

All sanitary plumbing and drainage work including the installation of fixtures and connection to the septic tank system via traps, waste pipes and drains shall be carried out in accordance with:

(1) National Plumbing and Drainage Code, AS 3500 Part 2, Sanitary Plumbing and Sanitary Drainage,

and

(2) Any SAHC variation to the above including exclusions or modifications prescribed by the Waste Control Regulations.

5 THE SEPTIC TANK

5.1 Introduction

A SEPTIC TANK SYSTEM may include the following:

- sanitary plumbing fixtures connected to drain pipes that enable sewage and sullage wastes to be conveyed from the fixtures to the septic tank,
- a septic tank,
- a pumping sump,
- an effluent disposal system,
- a roof, surface and subsurface water disposal system.

Where a septic tank effluent disposal scheme is not available, the site must be suitable for subsurface disposal within the allotment boundaries, otherwise an alternative system will be required. This may entail the collection of effluent in an impervious sump for subsequent removal from the property, or the installation of another recognised form of effluent/sullage disposal.

The minimum capacity septic tank permitted for installation in South Australia is sized to handle the sewage and/or sullage load for a minimum of six persons.

5.2 Principles of operation

Sewage and sullage wastes enter the septic tank where settlement of solid matter subsequently occurs. Anaerobic bacteria then partly breakdown this solid matter within the tank. The heavier solid matter falls to the bottom and forms sludge, whilst the fats and other lighter matter float to the surface and form a scum.

Three distinct zones exist within a septic tank - namely the scum, detention and sludge zones (see Figure 3).

The effective settling of solids is directly dependent upon the detention time within the tank. Excessive build up of sludge and scum reduces the capacity of the detention zone, resulting in discharge of suspended solids to the effluent disposal system.

The minimum period of time in the detention zone should be at least 24 hours to ensure 60% to 70% of the suspended solids are removed and that the *Biochemical Oxygen Demand* (BOD_5) is reduced by 30%. Therefore, the septic tank should be of sufficient capacity to provide for a 24 hour retention of the daily inflow into the tank.

The design criteria for an *all waste septic tank* suitable for a typical residential dwelling are:

- minimum daily inflow or hydraulic load of 150 litres per person per day,
- minimum detention of the daily inflow for 24 hours,
- sludge/scum accumulation rate of 80 litres per person per year,
- daily inflow based on not less than six persons,
- four yearly desludging frequency, or more often where high solid loads are experienced, as permitted by this Standard,
- where food waste disposal units are to be installed the capacity must be increased. (Refer to Section 5.7 *Non Standard Fixtures* in this Chapter).

For *WC only* septic tanks the minimum daily inflow or hydraulic load per person is 50 litres and the sludge scum accumulation rate is 55 litres per person per year. Detention time and population numbers remain as for *all waste*.

Small capacity septic tanks are adversely affected by flow surge, hence it is important that the types of discharge be taken into account when sizing the septic tank.

The inlet and outlet must be baffled to avoid undue disturbance to the contents, especially the scum.

Where the daily inflow for the septic tank is excessive, or the tank is not regularly desludged, the inflow retention time will be reduced, thus increasing the carry over of suspended solids to the effluent disposal system. This will decrease the effective life of the disposal system, failure of which may result in backflow into the house system, or overflow to the ground surface.

The *relevant authority* can institute legal proceedings to have defective waste control systems rectified.

5.3 Prohibited discharges

Unless otherwise approved by the SA Health Commission, no person shall permit or cause any of the following discharges into a septic tank system:

- any storm water, including roof and rainwater tank overflow, and surface drainage waters,
- any backflush waters from a swimming pool or water softener,
- any discharge or backflush from a spa bath/pool in excess of 680 litres capacity,
- any sanitary napkin, clothing or plastic material or liner,
- any trade waste,
- any petrol or other flammable or explosive substance whether solid, liquid or gaseous,
- any disinfectant or deodorant, antiseptic or germicide powder or fluid, unless specifically stated to be suitable for use in a septic tank,
- any other matter or substance which, in the opinion of the SA Health Commission, would impair the effective working of a septic tank.

Penalties apply for non compliance.

5.4 Septic tank capacities for residential dwellings

All wastes	***Litres***
Receiving all water closet pan and household liquid wastes, for up to 6 persons	3 000
For each additional 2 persons	add 1 000

Sewage only	***Litres***
Receiving sewage from a water closet pan for up to 6 persons	1 620
For each additional 2 persons	add 540

For multiple occupancy residential premises such as flats, units and town houses the capacity of the septic tank is calculated on the basis of total number of bedrooms plus one bedroom and multiply by 2 persons per bedroom.

EXAMPLE

4 units each with 2 bedrooms	= 8 bedrooms
8 bedrooms + 1 bedroom	= 9 bedrooms
9 bedrooms x 2 persons/bedroom	= 18 persons

This example assumes standard sanitary fixtures, i.e. no spa baths or food waste disposal units.

For institutional or aged care residential facilities, each bedroom will be calculated as 2 persons, unless legal documentation confirms that only one person will occupy the room (e.g. 150 litres per person). In such cases the relevant authority reserves the right to make allowances for visitors and/or other use.

5.5 Septic tank capacities for non-residential premises

Calculation of the septic tank capacity for non-residential installations requires determination of two factors:

- volume for accumulation of sludge/scum,
- volume for daily flow, into the septic tank.

The effective capacity is obtained by calculating: (S x P1 x Y) + (P2 x DF)

Where ...	S	=	Rate of sludge/scum accumulation per person per year,
	P1	=	Number of persons using the system,
	Y	=	Desludging frequency,
	P2	=	Number of persons using the system,
	DF	=	Daily inflow in litres per person per day.

Refer to Section 5.6, *Desludging Requirements* for details on the desludging frequency.

Chapter 11 - *Table 1* provides a range of load factors (S, P1, P2 and DF) to assist in determining the capacity of the septic tank, and it may be necessary to add a number of individual uses to obtain the sludge/scum and daily inflow total.

Where the system load varies from day to day, an average load figure is used to calculate capacity for sludge/scum accumulation.

Calculation of the daily inflow shall always be made using the maximum daily load.

The minimum capacity of any non-domestic septic tank shall be 1 620 litres or the effective capacity as calculated using Chapter 11 - *Table 1*, whichever is the greater.

5.6 Desludging requirements

The capacity of the septic tank for residential premises must be of sufficient volume to accommodate the sludge/scum generated over four years.

However, it is recognised that in commercial/industrial and non domestic residential premise this may be impracticable, thus resulting in excessively large septic tanks. Subject to acceptance by the relevant authority the desludging frequency may be reduced as follows:

Sludge/scum capacity required for a 1 year period	***Desludging frequency***
less than 5 000 litres	4 yearly
greater than 5 000 litres and less than 10 000 litres	2 yearly
greater than 10 000 litres	1 yearly

It should be noted that although a reduction in the desludging period may reduce the capital cost of installation, maintenance costs will be increased as the approval is conditional upon the septic tank being desludged more frequently.

Refer to Chapter 9, *Desludging The Septic Tank* for further information on maintenance of the septic tank.

5.7 Non standard fixtures

FOOD WASTE DISPOSAL UNITS

Food waste disposal units may be installed in kitchens of residential dwellings, provided that the effective capacity of the septic tank is *increased by 50% of the sludge scum capacity* to allow for the additional accumulation of solids in the tank. Where installed in individual flats, units and townhouses, the sludge scum capacity for the septic tank must be increased by 50% of the requirement for the individual premises containing the food waste disposal unit.

NOTE: *The soakage system for residential domestic premises does not normally require additional capacity. However, excessive use of the food waste disposal unit may necessitate more frequent desludging of the septic tank and extension of the disposal system if it is overloaded by increased hydraulic flow.*

Food waste disposal units may be installed in *commercial or non domestic residential premises* subject to specific approved from the relevant authority and the *septic tank capacity being increased by 50% of the total sludge scum and 10% of the hydraulic load capacity*.

SPA BATHS

A spa bath is a fixture, having a capacity of less than 680 litres which incorporates facilities for injecting air bubbles or jets of turbulent water and connects to the waste system in the same manner as a standard bath.

Units greater than 680 litres capacity are considered to be spa pools and connection to the septic tank system is *prohibited*.

Installation requirements ...

Sizing of the septic tank and the effluent disposal system is dependent upon the capacity of each spa bath and may require an increase in the capacity of the septic tank system.

Capacity of spa bath	***Septic tank capacity***	***Effluent disposal system***
less than 120 litres	No change	No change
> 121 to 370 litres	Increase by 250 litres	Increase contact area by $25m^{2*}$
>371 to 680 litres	Increase by 500 litres	Increase contact area by $50m^{2*}$

* based on an EPR of 10 litres per m^2 per day.

NOTE: *Excessive use of the spa bath may overload the effluent disposal system and require additional capacity within the disposal system to handle the hydraulic load.*

COMMERCIAL KITCHENS

(ie: non-domestic residential premises)

Unless otherwise directed, the discharge from any kitchen sink and/or dishwashing machine, in a commercial kitchen shall connect to an approved grease arrestor located as near as practicable to the kitchen sink and/or dishwasher, and unless otherwise approved, be located outside the building. Contact the relevant authority for further information.

5.8 Flushing cisterns

All cisterns and water closet pans connected to a septic tank system shall be matching dual 3 and 6 litre flush.

5.9 All waste system sanitary fixture hydraulic allowance

The following sanitary fixture allowance in litres has been used to determine the 150 litre hydraulic flow per person for a typical residential dwellings.

Fixture	***Litres***
basin	7
bath/shower	32
dishwashing machine/kitchen sink	30
laundry trough/washing machine	31
water closet pan	50
Total	***150***

No adjustment is required in a typical residential dwelling where the sanitary fixtures are duplicated e.g. an en-suite. Data contained in Chapter 11 - *Table 1* relates to a range of uses and may vary from that as shown above.

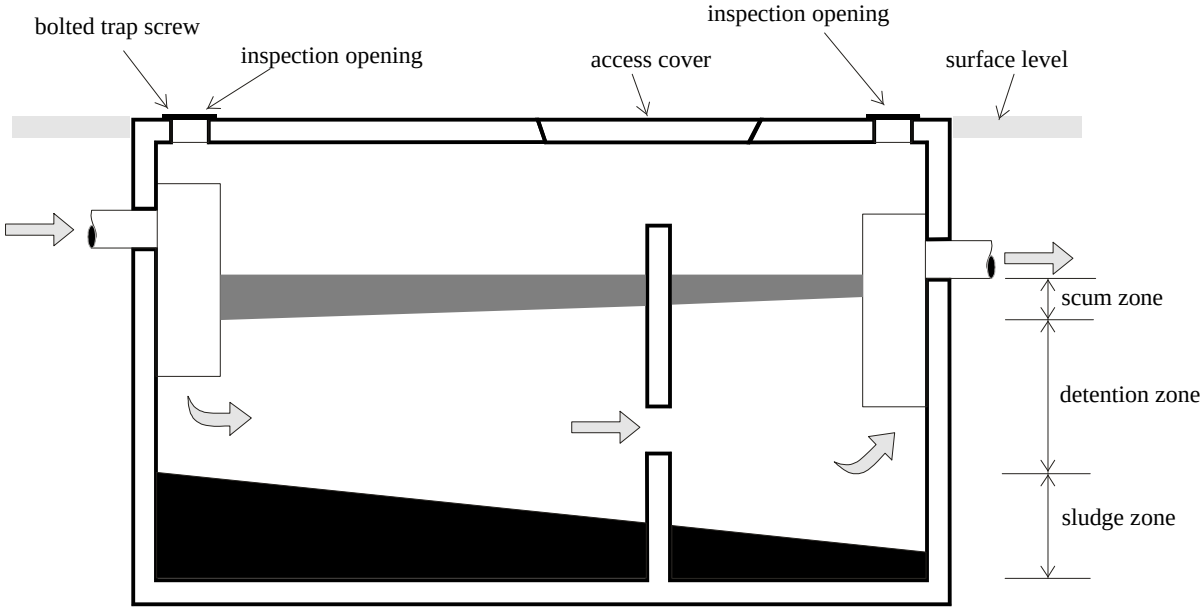


FIGURE 3: SEPTIC TANK ZONES

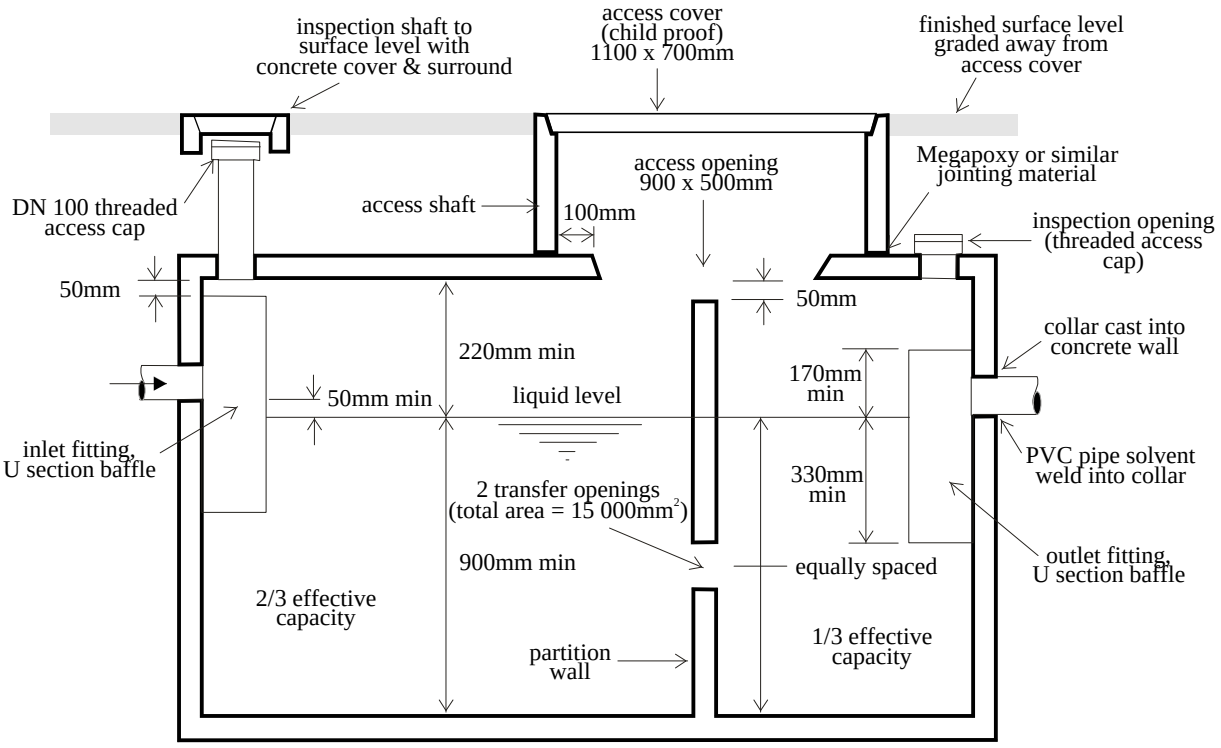


FIGURE 4: TYPICAL SEPTIC TANK DESIGN

6 SEPTIC TANK CONSTRUCTION

6.1 Introduction

Septic tanks installed in South Australia can be prefabricated or cast in situ, be manufactured with a vertical or horizontal axis and be formed in a cylindrical, rectangular or other shape and be constructed with reinforced concrete, glass fibre reinforced plastic, injection moulded foam polypropylene, rotational moulded polyethylene or other materials and processes as approved by the SA Health Commission.

All prefabricated septic tanks manufactured for sale and installation in South Australia must be approved by the SA Health Commission.

6.2 General provisions

(Figures 3 to 6 detail various aspects)

CONSTRUCTION & DESIGN

All septic tanks, unless otherwise approved by the SA Health Commission, shall be designed and constructed so that:

- there will be no structural failure or undue distortion under pressure when either full or empty and be protected from, or designed to withstand, loadings imposed by vehicles, buildings, soil and or ground waters and the internal loadings,
- the septic tank will be watertight and retain structural integrity during transportation, installation and operation,
- septic tanks over 2 500 litres shall be divided into two chambers so that the effective capacity of the first chamber is twice that of the second chamber,
- the length to width ratio is not less than 2:1 and a length to depth ratio of approximately 2:1,
- the effective liquid depth is not less than 900mm,
- where required, the dividing partition wall shall be provided with transfer openings centrally located within the liquid depth and be equally spaced from the vertical axis centre line and the external wall as shown in Figure 5, and with the total area of the transfer openings not less than 15 000mm^2. This requirement may vary depending on the tank configuration,
- connections to the septic tank shall be such that they permit standard solvent welded joints or rubber ring joints (AS 1260.2 and AS 1415.2) and enable the inlet and outlet pipe to be installed at grade,
- connections for the inlet, outlet and inspection openings are integrally cast for concrete constructed septic tanks, and for plastic type materials the connections are to be mechanically and/or chemically sealed or bonded so as to be water-tight and have a strength equal to that of the parent material,
- where the inlet, outlet and inspection opening fittings for plastic type septic tanks are permitted to be installed at the place of installation they shall be provided with fixing mechanisms and clear instructions to prevent incorrect installation with regard to grade and reversal of the inlet and outlet fittings,

- unless provided with an access opening located over the inlet and outlet fitting, the septic tank is to be provided with DN100 *inspection openings* fitted with threaded access caps, concrete block surround and cover over the inlet and outlet fitting and:
  - where not at surface level the *inlet* inspection opening is to be *shafted to the surface level,*
  - where subject to vehicle loadings, the concrete cover and surround is to be fitted in a manner to prevent transfer of live loads to the threaded access cap and inspection shaft.
- the septic tank must be installed on a compacted, level base and the top of the tank shall terminate at least 50mm above the finished ground surface level, with the surrounding surface graded away from the septic tank and be provided with *access covers* as follows:
  - be constructed of a material as approved and be of sufficient strength to withstand all imposed loadings including vehicle loads where situated in vehicle access areas,
  - be constructed so as to be child proof and effectively sealed to prevent the ingress and/or egress of water or gas and be removable for maintenance purposes,
  - be positioned centrally over the dividing compartment wall and have an access opening of at least 900mm long and 500mm wide, or be positioned over the inlet and outlet fittings and have dimensions to ensure an access opening of at least DN500 or 500mm x 450mm,
  - for septic tanks *over 5 000 litres* capacity, be provided with access opening of at least 900mm long and 500mm wide and be positioned centrally over the dividing wall or have access openings of at least DN600 and be positioned to permit inspection of the inlet and outlet fitting and enable access to each compartment for maintenance,
- where it is not practicable to terminate the top of the septic tank at surface level it will be necessary to provide *access shafts fitted with access covers and an inspection opening* finishing at surface level in a manner as indicated above, and:

  Access shafts

  - shall have internal dimensions of at least 200mm greater than the access opening in the top of the septic tank,
  - where deeper than 1200mm shall be provided with an access ladder in accordance with AS 3500.2 and AS 1650,
  - shall be effectively sealed to prevent the ingress or egress of water or gas,
  - where approved and not subject to vehicle loadings, the access cover at surface level may be constructed of 6mm steel checker plate galvanised in accordance with AS 1650 and be fixed with non-ferrous child proof fixings, provided the access opening in the top of the septic tank is fitted with an access cover so as to be gas and water-tight and removable for maintenance. In this situation, the access cover must also be easily removable from the access shaft through the top access opening,
  - where an access shaft and cover is provided it is to be constructed of the same material as the septic tank or other material as approved and be of sufficient strength to withstand all loadings imposed including vehicles where situated in vehicle access areas,
  - the access shaft on two compartment septic tanks of up to 5 000 litre capacity must be positioned over the dividing compartment wall unless otherwise approved and have an access opening of at least 900mm x 500mm and permit access by a person into each compartment,
  - for two compartment septic tanks *greater than 5 000 litres* capacity the access shaft is to be at least 1 100mm x 700mm or DN800 and be provided with child proof covers of at least 900mm x 500mm of DN600 effectively sealed to prevent the ingress or egress of water or gas and be removable for maintenance purposes.

Inspection shafts

- where required, shall be shafted to the surface and fitted with a threaded access cap, concrete block and cover,
- where situated in areas subject to vehicle loadings, the concrete cover and surround must be fitted in a manner to prevent direct load onto the threaded access cap and inspection shaft.

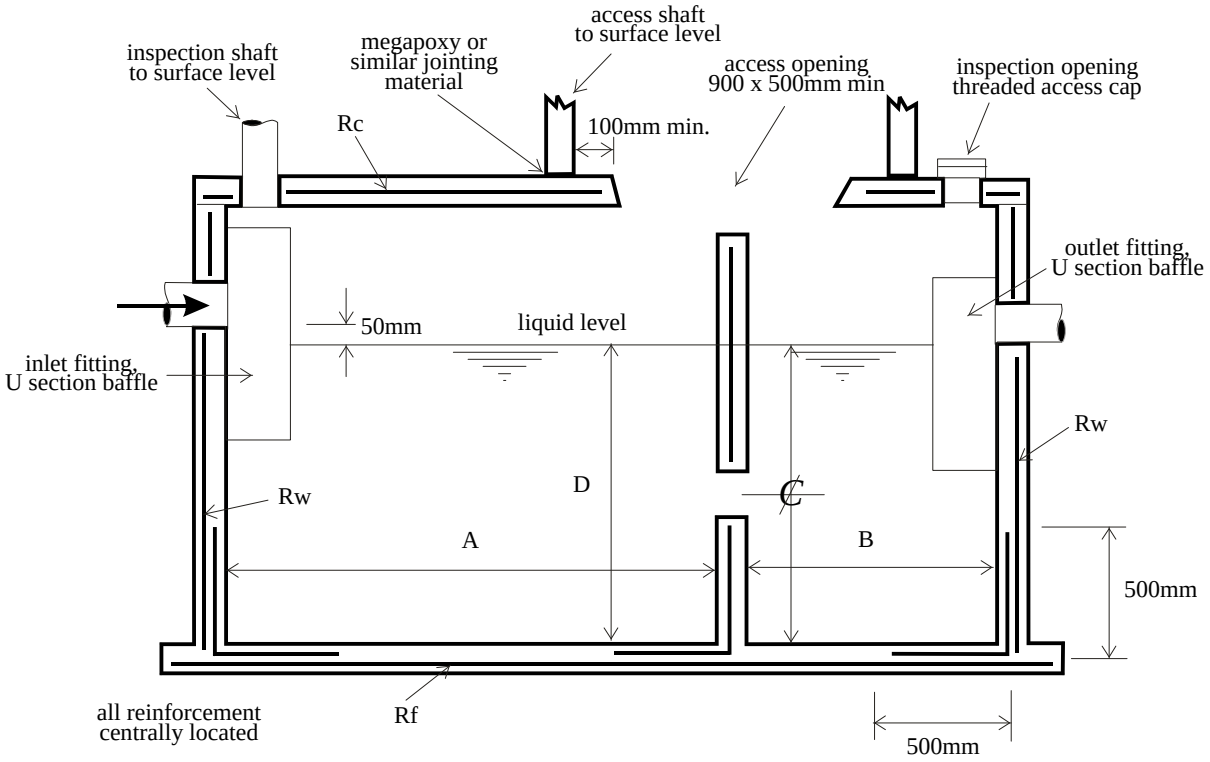
- the tank shall is permanently and legibly marked on the external face of the inlet wall and on the top immediately adjacent to the inspection opening over the inlet junction as follows:
  - mass in kilograms (not applicable for cast in situ tanks),
  - year, month and date of manufacture,
  - manufacturer's name or registered trademark (on top only for cast in situ tanks),
  - capacity in litres,
  - clear handling and installation instructions (e.g. for plastic type septic tanks or steel fibre reinforced concrete septic tanks etc.).
- except as indicated above, the provisions of AS 1546, *Small Septic Tanks*, apply,
- the capacity for septic tanks are determined in accordance with the provisions in Chapters 5 and 6 and Chapter 11 - *Table 1*.

Applications for approval from the SA Health Commission to construct septic tanks of greater than 5 000 litres capacity, or at variance with the above provisions, will need to have engineering calculations, full specifications supporting materials, design, method of construction, structural integrity and relevant test data.

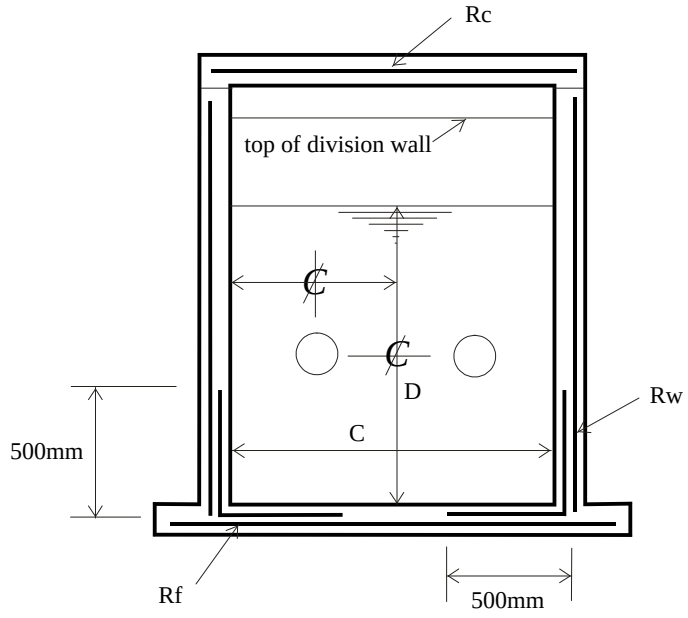
The SA Health Commission reserves the right to require additional data demonstrating suitability and this may include field testing.

POSITIONING THE SEPTIC TANK

- unless otherwise specifically approved, all septic tanks must be positioned at least 2.5 metres from all buildings, allotment boundaries and effluent disposal systems,
- a septic tank must not be installed where its position may affect the stability of any building on the site or adjoining sites. Where appropriate it shall be positioned further than 2.5 metres from the building or buildings or adjoining sites. In situations where the placement of the septic tank intersects the angle of repose for the building footing or foundations, or its position may affect the stability of building footings and foundations, the excavation may be backfilled with lean mix concrete, e.g 10 MPa, where specifically approved or permitted by the relevant authority, the council and the footing engineer,
- the septic tank shall be positioned as far as possible from a watercourse. In no case shall it be located less than 10 metres from a watercourse and it may be required to be positioned further away under the provision of the Development Plan under the Development Act and as detailed in the Mt. Lofty Ranges Comprehensive No.2 and amendments,
- in all cases, except as otherwise required by the Mt. Lofty Ranges Comprehensive No.2 and amendments, where located in close proximity to a watercourse, the septic tank should be located on land above a 10 year return period flood event,
- where it is not possible to locate the septic tank above the 10 year return period flood event, it will be necessary to have the access cover and inspection openings shafted so as to terminate at least 150mm above the 10 year return period flood event level. This provision does not apply for septic tanks installed in locations covered under the Mt Lofty Ranges Comprehensive No. 2 and amendment requirements,
- specific provisions of the Environment Protection Act and Regulations may be applicable for septic tanks installed in a *Water Protection Area* and having a capacity greater than 100 persons.



LONGITUDINAL SECTION



CROSS SECTION

FIGURE 5: CAST IN SITU CONCRETE SEPTIC TANK

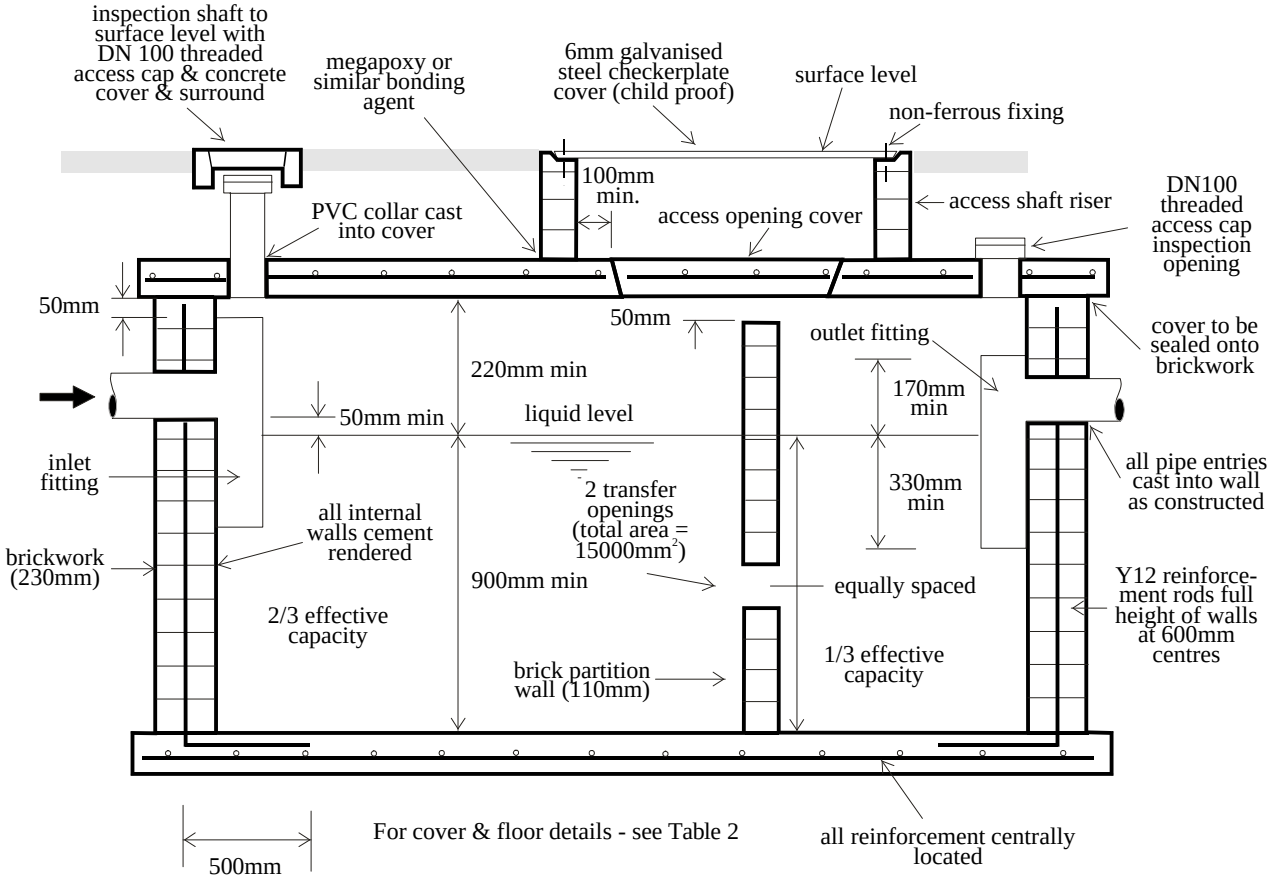


FIGURE 6: RECTANGULAR BRICK SEPTIC TANK

6.3 Pre cast septic tanks

Pre cast septic tanks shall be constructed in accordance with Section 6.2, *General Provisions* of this Chapter.

NOTE: *The sale of pre cast septic tanks is controlled by the Public and Environmental Health (Waste Control) Regulations 9 and 10 which provides:*

(1) a person must not manufacture or construct a waste control system or a component, part or product for a waste control system except as authorised by the relevant authority (SAHC), and,

(2) a person must not sell, expose or have in his/her possession for the purpose for sale a waste control system unless the waste control system has been manufactured or constructed under an approval by the relevany authority (SAHC).

(3) penalties apply for non compliance.

6.4 Cast in situ concrete septic tanks

(see Figure 5 and Chapter 11 - Table 2)

In addition to Section 6.2, *General Provisions* of this Chapter, this method of construction is generally used where larger capacity septic tanks are required e.g., greater than 10 000 litres. The tank shall be structurally sound, smooth internally, watertight and the concrete used shall comply with the requirements of AS 3600 *Concrete Structures* and AS 3735 *Concrete Structures for Retaining Liquids*, and shall have a compressive strength of not less than 25 MPa at 28 days.

Approved construction details for a range of cast in situ septic tanks of up to 10 000 litres capacity are provided in Figure 5 and Chapter 11 - *Table 2*.

NOTE: *The data contained in Chapter 11 - Table 2 are based upon compliance with the following requirements:*

- *the depth of soil cover over the septic tank is not greater than 1 metre,*
- *the air space between the liquid level in the septic tank and the under side of the cover is not greater than 220mm,*
- *all reinforcement is placed centrally, and,*
- *the septic tank is not subject to any vehicular traffic loading.*

Where the required capacity does not exceed 10 000 litres and the capacity of the septic tank does not coincide with that shown in Chapter 11 - *Table 2* it shall be constructed to the specifications of the next largest size.

NOTE: *For installation of cast in situ septic tanks not in accordance with the data in this section; or subject to vehicle loadings; or greater than 10 000 litres, approval is required from the relevant authority and will need to be supported with detail drawings, engineering calculations, material and construction specifications and comply with Section 6.2 "General Provisions" of this Chapter.*

6.5 Built in situ rectangular brick septic tanks

Septic tanks with an effective capacity of up to 5 000 litres may be of brick construction (see Figure 6).

In addition to Section 6.2, *General Provisions* of this Chapter, brick septic tanks shall be constructed in accordance with the requirements for cast in situ concrete septic tanks, and as follows:

- constructed from clay or concrete building blocks, bonded and set in water proofed cement mortar,

- the floor of the septic tank shall be constructed in accordance with the requirements of Chapter 11 - *Table 2*,
- the walls of the septic tank shall be 230mm brick work laid using a header/stretcher bond, or 200mm concrete building block. Where hollow blocks are used they shall be filled with concrete,
- the junctions between the side and end walls shall be bonded or otherwise reinforced to ensure the integrity of the junction,
- the junction between the walls and floor shall be reinforced using Y12 (12mm deformed bar) starter bars extending horizontally into the floor for 500mm and for the full height of the wall. The starter bars shall be at not less than 600mm centres,
- the internal surfaces of the septic tank shall be rendered smooth and impervious with cement mortar containing a water proofing additive, to a minimum thickness of 15mm,
- the cover slab of the septic tank shall be constructed in accordance with the requirements of Chapter 11 - *Table 2*,
- dimensions and sizes are otherwise as shown in Figures 4 and 5 and Chapter 11 - *Table 2*.

6.6 Septic tanks manufactured from plastic or similar materials

AS 1546, *Small Septic Tanks* provides for septic tanks manufactured from a range of materials including fibreglass reinforced plastic, injection moulded foam polypropylene and rotational moulded polyethylene and requires that they be manufactured in accordance with specific requirements. They also need to comply with the general and specific requirements of this Section.

All plastic type septic tanks should be bedded in a compacted sand base and backfilled with sand unless otherwise permitted by the manufacturers instructions and/or specific approval conditions.

7 THE EFFLUENT DISPOSAL SYSTEM

7.1 Introduction

The design of the on-site subsurface effluent disposal system requires careful planning to ensure safe and hygienic disposal of septic tank effluent. The physical characteristics of the site are major factors in its potential for disposal of effluent into the soil.

The applicant/owner is required to provide evidence demonstrating that the disposal site is capable of achieving effective long term subsurface effluent disposal.

Because adverse soil characteristics are encountered in many parts of South Australia, the site intended for subsurface disposal of effluent must be assessed by a geotechnical consultant to obtain a report confirming that the site is suitable for subsurface effluent disposal within the requirements outlined in this Standard.

Consideration should be given to investigating alternative methods of disposal where it is known that the site characteristics are not favourable for subsurface effluent disposal. This may enable the owner to avoid the expense of geotechnical investigation such as soil and/or percolation testing.

Many factors are associated with the determination of site suitability and the following aspects need to be investigated in assessing the site.

7.2 Site assessment criteria

LAND SLOPE

(see Note 1)
Land slope should not be greater than 20% (1 in 5)

FLOODING

(see Note 1)
The site should not be subject to inundation or flooding more frequently than 1 in 10 years.

SEASONAL & TIDAL WATER TABLES

(see Notes 1, 2, 3,4 and 5)
The depth to a subsurface seasonal tidal or permanent water table, fresh or saline, should be greater than 1.2m from the ground surface level.

BEDROCK

(see Notes 1 and 2)
The depth to bedrock should be greater than 1.2m from the ground surface level. (Bedrock for the purpose of this Standard is unbroken solid rock and includes shallow cap rock formations found in many parts of South Australia. See comment on *rock* under *soil characteristics* in this Section).

NOTE: *(1) specific provisions of the Development Plan under the Development Act, namely, Mt. Lofty Ranges Comprehensive No. 2 and amendments preclude the siting of an effluent disposal system on land:*
- *having a slope greater than 20% (1 in 5),*
- *having less than 1.2m depth from the surface to bedrock, seasonal or permanent water table,*
- *situated in an area likely to be inundated by a 10 year return period flood event.*

(2) the 1.2m depth is based on the assumption that the soil within the horizon is adequate for the proposed disposal system.

(3) where the effluent disposal system is likely to be in a horizon subject to tidal water inundation, it will be necessary to determine that its placement will not create adverse environmental impacts within the marine (coastal) waters intertidal zone.

(4) the Regional Coastal Areas Policies amendment to the Development Plan under the Development Act requires that effluent disposal systems should not be located less than 100m from the high water mark,

(5) specific provisions of the Environment Protection Act and Regulations are applicable for effluent disposal systems installed in "Water Protection Areas" and having a capacity greater than 100 persons.

LAND AREA

The size of the area of land available for effluent disposal within the allotment must be adequate and suitable for the intended use.

LOCATION OF EXISTING DEVELOPMENT

The location of existing development on the site or on adjoining sites including upslope from the proposed effluent disposal area, must be considered to ensure that they do not adversely affect the proposed system. Care should also be taken to ensure compliance with the respective setback distances specified in this Standard.

LAND USE

The number of persons using the site, the nature of the facilities to be installed and the type of land use will affect the capability of the site to absorb the effluent generated.

OCCUPANCY

The number of days that the system is used will affect the capacity of the disposal system.

AVAILABILITY OF WATER

Some premises are dependent on stored rainwater and this will limit the potential volume of effluent for disposal.

SOIL CHARACTERISTICS

Features requiring examination include:

- *soil colour* - mottling is usually caused by a fluctuating water table or seasonal zones of saturation. It may be evidence of high ground water or poor drainage,
- *soil texture* - an examination of the depth and thickness of the various soil layers should be undertaken and any impervious layers noted. The assessment should include the determination of the relative proportions of silt, clay, sand and gravel,
- *soil structure* - structure, or the capability of the soil to form peds (aggregation of soil particles into clusters), is important in assessing the porosity of the soil. Porosity or void space is particularly significant as it facilitates percolation of the effluent into the soil. The more cohesive the soil, the slower the percolation rate,

- *rock* - where rock is encountered an examination of the structure should be carried out to determine fissures, joints and bedding planes that may influence percolation. Where rock is located that may preclude the installation of a subsurface soakage system above the rock layer, and subject to practicability, examination of the soil below the rock layer should be done to determine its suitability for percolation,
- *poor cohesion* - where the soil, including rocks, has poor cohesion characteristics, the potential exists for an adverse impact on sensitive environmental resources situated below or downstream from the site. Sensitive environmental resources include land form, marine environs, stream, surface and subsurface water bodies. Section 7.4.2, *Setback Distances* imposes specific setback distances as a means of protecting sensitive resources.

A number of bore holes are required to determine soil characteristics. This work is normally carried out at the same time as the geotechnical assessment of the site for the building footings. Information contained in this report is useful in determining the type of soils found on the site.

Where borelogs are not taken for a geotechnical assessment for the building footings the relevant authority may require a direct assessment for the purpose of determining the percolation capability of the soil.

SOIL PERMEABILITY (PERCOLATION)

The effective disposal of septic tank effluent by subsurface soakage depends upon the rate at which the effluent percolates into the soil.

The rate of percolation is influenced by two factors:

- the biological solids accumulation (biomass), and
- soil permeability.

The biomass operates quite independently of the soil type in limiting the rate of percolation. Once percolation through the biomass is achieved, the surrounding soil becomes the next barrier.

Soil permeability must be determined by either the indirect or direct method of assessment to ascertain the effective long term percolation capability of the soil as follows:

- *the indirect method* involves taking a series of borelogs and subjecting the soil to geotechnical assessment,
- *the direct method* involves percolation tests with acceptable results from 15mm to 150mm per hour when determined by the *Falling Head Test* or the *Static Head Test*.

Indirect method

All indirect soil assessments are to be determined in accordance with the system of classification as detailed in AS 1726 - *Geotechnical Site Investigations*. The report should provide a description of each soil layer encountered in each bore hole and in addition to classifying the soil, a statement as to the horizon best suited for long term percolation of septic tank effluent, including the estimated rate of percolation e.g. minimum of 15mm per hour.

In addition to the three boreholes for building footing soil assessment, two boreholes need to be taken from the area where the effluent disposal system is to be located. The depth of the borehole should extend to three metres or at least 500mm below the intended depth of the disposal system.

The percolation capability of each soil horizon is to be determined from soil borelog results classified in accordance with AS 1726, *Table A1* as follows:

Soil type	*Group symbol*	*Permeability class*
Fine Grained Soils		
CLAY or SILT, sandy or gravelly CLAY or SILT (< 50% retained on 0.075mm sieve)	Pt, OH, CH, MH, OL, CL, CI, ML	Practically Impermeable

Soil type	*Group symbol*	*Permeability class*
Coarse Grained Soils		
Fine or medium SANDS, silty or clayey SANDS Silty or Clayey SANDS	SC, SM, SP, SW, GC, GM	Poor Soakage
Clean coarse SANDS, Clean GRAVEL	SP, GP, GW	Good Soakage

When using the indirect method for determining the suitability of the soil for long term percolation capability, care must be taken to ensure that the selected soil horizon is consistent throughout all soil boreholes and of a depth of at least 1.2m to enable the chosen effluent disposal system to be positioned within the selected horizon.

Sites where soils are classed as *Practically Impermeable* are unlikely to be suitable for long term absorption of septic tank effluent. Subsurface effluent disposal may be permitted by the relevant authority where a geotechnical consultant has provided evidence as to the suitability of the soil or percolation test results demonstrate suitability.

NOTE: *The relevant authority reserves the right to require the applicant/owner to have percolation tests performed and to provide the results of such testing for assessment prior to granting approval.*

Direct method

Percolation tests, using either the *Falling Head Test* or *Static Head Test*, give a more reliable indication of the capacity of the soil to sustain long term percolation capability.

Some form of preliminary site and soil investigation should be undertaken before commencing percolation testing, to determine the depth of the disposal system and to establish the soil horizon most suited to effective percolation and installation of the disposal system.

A minimum of five percolation tests is required on the site proposed for subsurface effluent disposal. It is important that the number of tests taken should be sufficient to properly determine the effective percolation capability of the soil.

The geometric mean of the percolation test results will be used when calculating the minimum subsurface soakage system requirements prescribed in this Standard.

Percolation rates greater than 150mm per hour must be assessed against the potential for the proposed disposal system to contaminate environmental resources, including sensitive land and marine environs or stream, surface and subsurface water bodies.

Percolation rates of less than 15mm per hour can be used, but the economics of installing very large soakage systems should be assessed with regard to the amount of land available and the installation costs. Refer to the Notes in Chapter 11 - *Table 3*.

DEPTH OF SOIL HORIZON

The depth of the suitable soil horizon nominated for the installation of the subsurface trench or bed disposal system referred to in this Chapter should be based upon:

- a depth of at least 1.2m,
- an effluent percolation rate of at least 10 litres/m^2/day,
- having the topmost part of the subsurface disposal system within 100mm of the top of the horizon,
- the subsurface disposal system not exceeding 600mm in depth,
- the soil horizen extending at least 500mm below the base of the subsurface disposal system.

If these conditions are not met, the waste control system will require longer disposal trenches or beds to compensate for the loss of effluent percolation capacity from the trench/bed base and side walls.

FAILURE TO SATISFY SITE ASSESSMENT CRITERIA

Where the site fails to satisfy any of the *site assessment criteria*, the waste control system may need to be modified to include additional treatment and/or disposal requirements, or alternatively, require offsite effluent disposal.

7.3 System design

7.3.1 GENERAL

To determine the minimum requirements for a subsurface effluent disposal system it is necessary to calculate the required contact area in square metres.

The formation of the bio-mass on the soil contact surfaces within the soakage system is a limiting factor on the effluent percolation rate. The cumulative effect of the bio-mass is greater in cohesive soils such as clay, silts and fine sands, the exception being when the soil is in the limiting factor; e.g. heavy clay or rock etc.

The effluent percolation rates shown in Chapter 11 - *Table 3*, take into account the effect of the biomass, and are set as the effective long term effluent percolation rates (EPR).

The EPR is expressed in litres/m^2/day.

To calculate the required contact area for a subsurface soakage system use the formula:

$$\frac{P2 \times DF}{EPR} = \text{Required contact area in } m^2 \text{ for the total daily inflow}$$

Where...

P2 = number of persons using the system. In the case of residential/industrial or commercial premises, P2 shall be not less than 6 persons,

DF = daily inflow in litres per person per day,

EPR = effluent percolation rate (Refer to Chapter 11 - *Table 3*).

7.3.2 FOR SINGLE & MULTIPLE RESIDENTIAL DWELLINGS

A range of options is available to determine the minimum contact area required for the soakage system for residential dwellings (all waste system). The minimum contact area is determined as above, and calculated according to the type of water supply serving the premises as this alters the daily inflow rate (DF). (Refer to Chapter 11 - *Table 4 or 5*)

To determine the minimum subsurface soakage requirement proceed as follows:

- using the information obtained by either the *Indirect Method* or the *Direct Method* for determining the long term percolation capability, refer to Chapter 11 - *Table 3* and obtain the appropriate effluent percolation rate (EPR),
- refer to Chapter 11 - *Table 4 or 5*, depending on type of system to be installed, and according to:

Type of water supply

- where the water supply is via a private or government reticulated system the daily in-flow rate is 150 litres/person/day,
- where the water supply is by means of roof catchment storage or stored carted water the daily in-flow rate is 125 litres/person/day.

Effluent percolation rate

- where the percolation rate is determined by the *indirect method* and is classified as:
  - practically impermeable - the EPR will be equal to or less than 10 litres/m^2/day depending on the percolation rest result,
  - poor soakage - the EPR will be 10 litres/m^2/day,
  - good soakage - the EPR will be 15 litres/m^2/day.
- where the percolation rate is determined by the *direct method* to be:
  - between 15 mm and 23mm - the EPR will be 10 litres/m^2/day,
  - greater than 23 mm - the EPR will be 15 litres/m^2/day,
  - between 15mm and 10mm the EPR of 10 litres/m^2/day will be reduced by 1.5 litres/m^2/day for each 1mm below 15mm. Refer to example in Chapter 11 - *Table 3*.

EXAMPLE

A residential dwelling serving up to 6 persons and having a reticulated water supply and soil classified by the *indirect method as having an EPR of 10 litres/m^2/day* would require a subsurface disposal system sized as follows:

P2 = 6 persons

DF = 150 litres/person/day

EPR = 10 litres/m^2/day

$$\frac{P2 \times DF}{EPR} = \frac{6 \times 150}{10} = 90\ m^2 \text{ contact area}$$

EXAMPLE

A residential dwelling serving up to 8 persons and having a rainwater supply and a soil classified by the *direct method* to have a percolation rate of 55mm/hr would require a subsurface disposal system sized as follows:

P2 = 8 persons

DF = 125 litres/person/day

EPR = 15 litres/m^2/day (ie >23mm/hr)

$$\frac{P2 \times DF}{EPR} = \frac{8 \times 125}{15} = 66.7\ m^2 \text{ contact area}$$

EXAMPLE

A residential dwelling serving up to 6 persons and having a reticulated water supply and a soil classified by the *direct method* to have a percolation rate of 13mm/hr would require a subsurface disposal system sized as follows:

P2 = 6 persons

DF = 150 litres/person/day

EPR = 7 litres/m^2/day (reduced by 1.5 litres/m^2 for every 1mm below 15mm, see Chapter 11 - *Table 3* for details).

$$\frac{P2 \times DF}{EPR} = \frac{6 \times 150}{7} = 128\ m^2 \text{ contact area}$$

Refer to Chapter 11 - *Tables 6 to 9* to obtain the minimum subsurface soakage requirements.

NOTE: *(1) Where Chapter 11 - Tables 6 to 9 show trench lengths in metres these are to be taken as the standard trench dimensions as indicated in Section 7.4.3 of this Standard.*

(2) Where the direct method or indirect method indicates a soil horizon having the appropriate percolation capability it is necessary that the effluent disposal systems is installed within the nominated horizon and it has a depth of at least 500mm extending below the base of the selected disposal system.

(3) In situations where the discharge from the septic tank to the soakage trench positioned in the appropriate soil horizon cannot be achieved by gravity flow, then the effluent shall be lifted from a pump sump, with a motor operated pump, to the disposal system.

7.3.3 FOR NON-RESIDENTIAL PREMISES

To determine the minimum subsurface soakage requirements use the formula as shown in Section 7.3.1 *General Provisions* and proceed as follows:

- using Chapter 11 - *Table 1* obtain the appropriate P2 and DF values for the intended use,
- where appropriate it may be necessary to calculate a range of use factors for a single installation, and add them to obtain the total requirements,
- using the information obtained from either the *Indirect* or *Direct Method* for determining the long term percolation capability and Section 7.3.1 *General Provisions*, refer to Chapter 11 - *Table 3* to obtain the appropriate effluent percolation rate (EPR),
- having established the minimum contact area in square metres refer to Section 7.4 *System Construction* to determine the disposal system requirements.

NOTE: *The minimum contact area for a subsurface soakage system for any non-residential premises shall be 30 square metres or the effective area as calculated, whichever is the greater.*

EXAMPLE

A warehouse/store with four employees working only 1 shift (no shower facilities provided) and served by a reticulated water supply and having a soil classified by the *indirect method* to have an EPR of 10 litres/m^2/day would require a subsurface disposal system sized as follows:

P2 = 6 persons (minimum number)

DF = 30 litres/person/shift (1 shift only)

EPR = 10 litres/m^2/day

$$\frac{P2 \times DF}{EPR} = \frac{6 \times 30}{10} = 18\ m^2$$

As this is less than the minimum contact area, 30 m^2 is required

7.3.4 TEMPORARY OCCUPATION

For caravan parks and holiday camps, *not permanently occupied*, one of the following formulae should be used. These formulae are only used for situations of temporary occupation - i.e. where the *maximum continuous period* of full occupancy does not exceed 42 days in any 120 day period.

If the period of full occupancy exceeds these criteria, then calculate the requirements as for permanent occupancy. An occupancy rate exceeding 60 per cent is considered to be full occupancy.

NOTE: *These provisions do not relate to the sludge scum capacities of the septic tank.*

Formulae

(1) where the EPR is 10 litres/m^2/day:

$$\frac{P2 \times DF}{10} \times \frac{75}{100} = \text{required contact area in } m^2$$

(2) where the EPR is 15 litres/m^2/day:

$$\frac{P2 \times DF}{15} \times \frac{85}{100} = \text{required contact area in } m^2$$

7.4 System construction

7.4.1 GENERAL

- The system should be installed within the soil horizon having a depth of at least 500mm below the underside of the selected subsurface disposal system to be installed, and as shown by geotechnical evidence and/or percolation testing to provide the optimum level of soil permeability,

NOTE: *Where discharge to the soakage system sited in the appropriate soil horizon cannot be achieved by gravity flow it will be necessary to pump the effluent to the subsurface disposal system.*

- Where a seasonal, tidal or permanent water table is encountered or is known to exist below the surface level, an assessment of the potential to contaminate the water table or marine environment shall be made,

NOTE: *Should a potential for contamination of a potable water table or marine environment exist, approval to install a subsurface disposal system may be refused.*

- In the case of a suitable shallow soil horizon or where a water table or bedrock is encountered, the base of the subsurface disposal system shall be at least 500mm above the base of the suitable soil horizon or the highest level of the water table or bedrock,
- On sloping sites the preferred position of the subsurface disposal system is down-slope from the building. This may not always be practicable and may require larger setback distances,

NOTE: *Where it is intended to locate the subsurface disposal area up-slope of the building, the footing design engineer should be consulted to determine likely impact on the building footing and any additional requirements such as diversion trenches. This detail is required to be provided with the application.*

- The subsurface disposal area must not be subject to vehicle traffic loadings and must be protected from roof, surface and migrating subsurface waters, by diverting these waters to the street water table, or to a point beyond the effluent disposal area. (See Figures 18 to 20). Refer also to Section 7.6.2 *Diversion Trench*,
- The subsurface disposal system should be positioned within the natural ground, be sited along a level contour, and the trench floor must be level. The relevant authority may permit variation where adequate geotechnical evidence is provided demonstrating suitability and that the drainage will not result in system failure or off site impact,
- During excavation of the subsurface disposal system, care should be taken to avoid smearing the trench wall and floor surfaces. Where smearing occurs, the typical characteristics of the soil should be reinstated using hand tools,
- 40mm aggregate complying with AS 2758.2 shall be used within trench, well and bed subsurface disposal systems as indicated in Figures 12 to 15,

NOTE:
A single length of soakage trench 1.2m wide may be installed where the allotment is at least 50 metres wide.

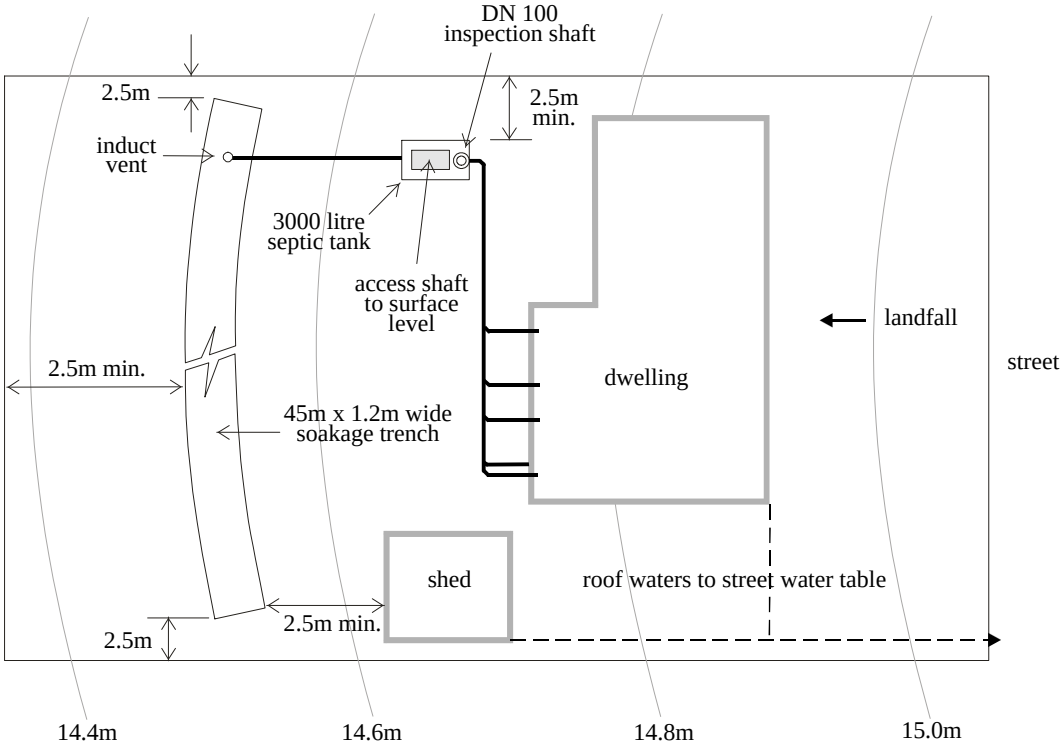


FIGURE 7: SYSTEM LAYOUT

NOTE:
A single length of soakage trench 2.5m wide may be installed where the allotment is at least 32 metres wide.

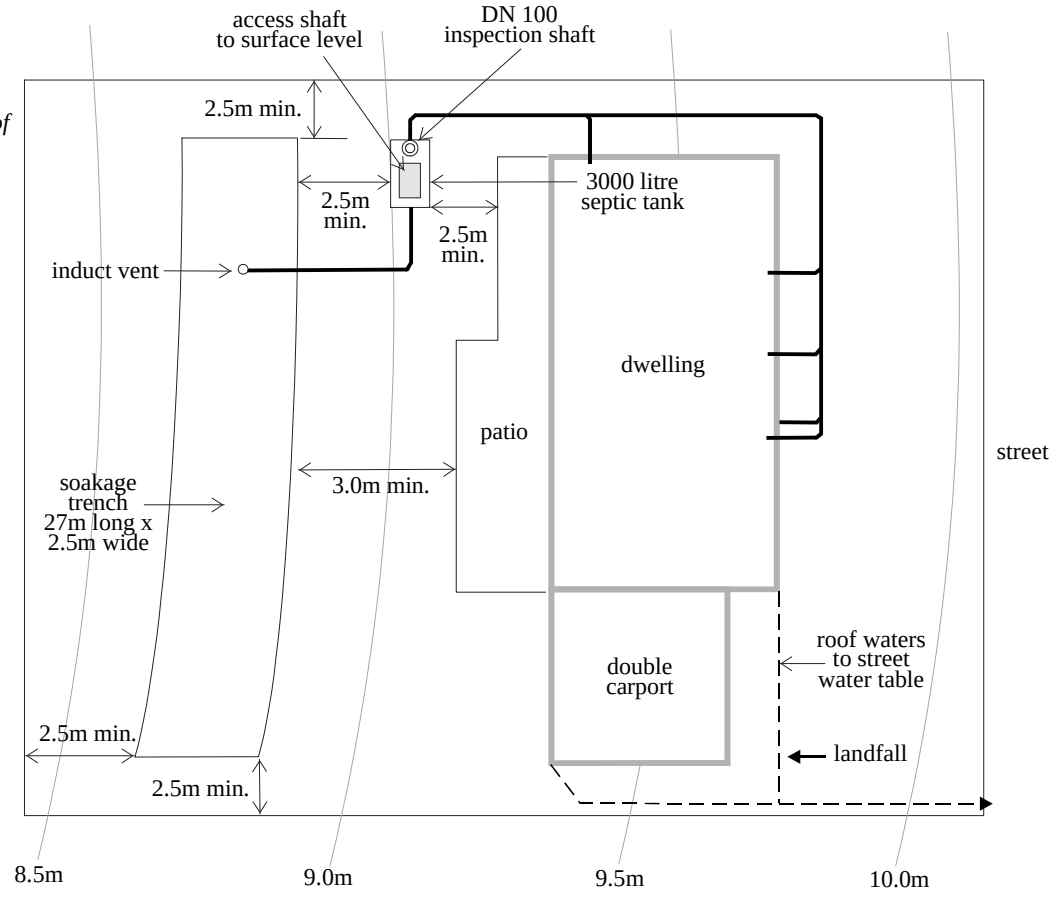


FIGURE 8: SYSTEM LAYOUT

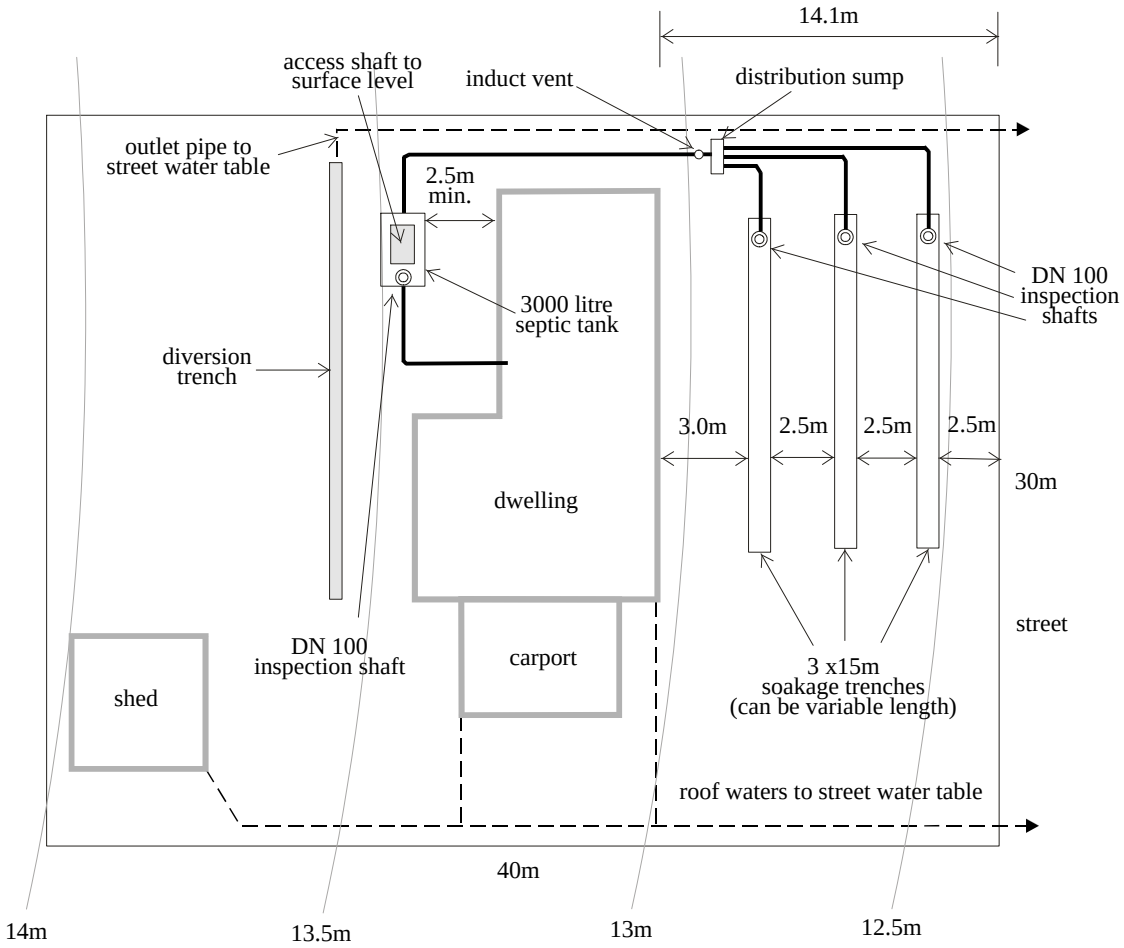


FIGURE 9: SYSTEM LAYOUT

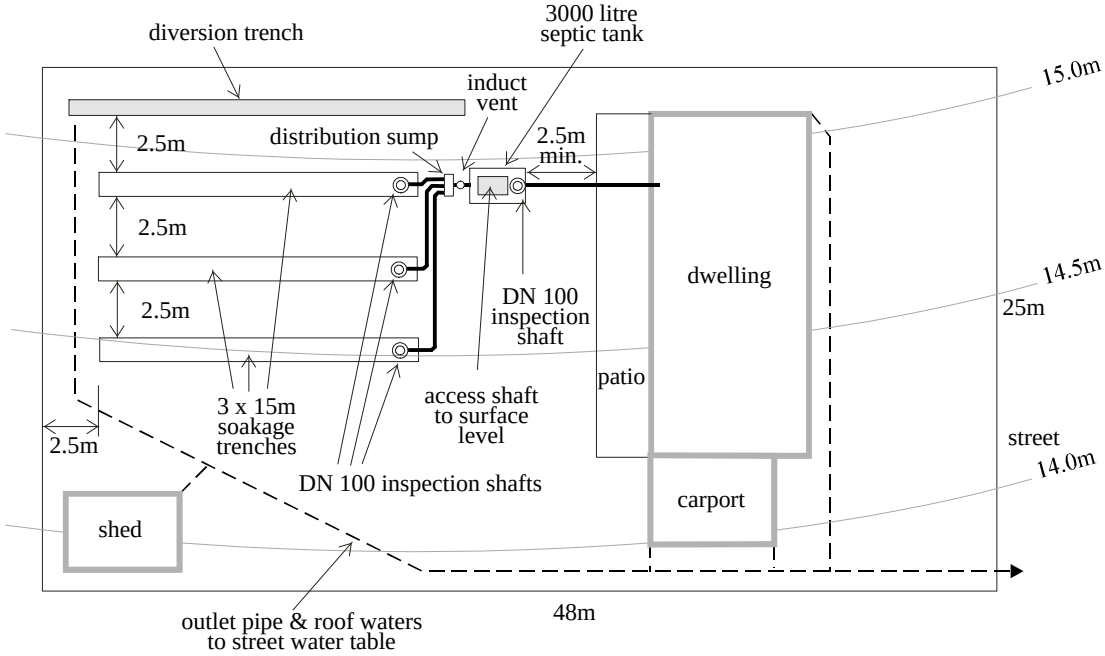


FIGURE 10: SYSTEM LAYOUT

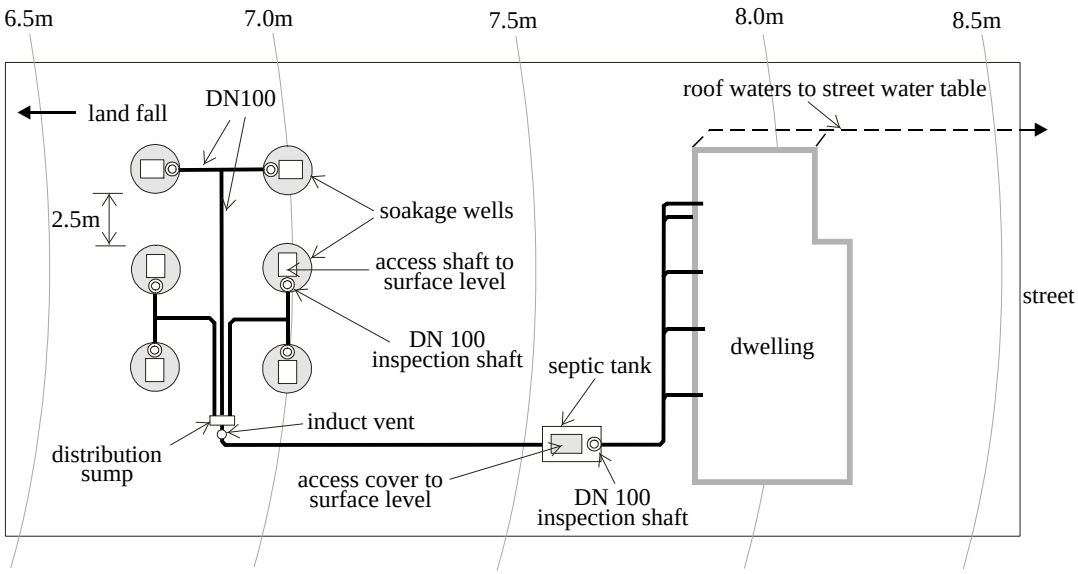


FIGURE 11: SYSTEM LAYOUT

- The subsurface disposal system shall be covered with geotextile complying with AS 3705 before backfilling with friable soil. The geotextile prevents movement of fine soil particles into the subsurface disposal system and permits vertical movement of effluent.
- Where multiple trenches are used it will be necessary to install a distribution sump to discharge effluent evenly to each trench, (see Figures 16 and 17). Multiple trenches should be of equal length as far as is practicable,
- An induct vent is required to be provided on the inlet pipe to each run of a multiple soakage trench system,
- Alternatively, where a multiple trench system is used the induct vent may be located between the septic tank outlet and the inlet to the distribution sump. In this case each pipe entry into each multiple run of the soakage trench shall be fitted with a riser shafted to ground surface level as an inspection shaft and then finished with an approved threaded access cap and concrete block and cover,
- All pipework from the septic tank to the soakage system shall be a minimum of DN 100.

Figures 7 to 11 provide a range of schematic system layouts.

7.4.2 SETBACK DISTANCES

Effluent disposal systems must be positioned *at least*:

- 2.5 metres - from septic tanks, pumping tanks, allotment boundaries, diversion trenches, including soakage trenches, soakage wells or any other subsurface disposal system,
- 3.0 metres - down slope from a building or a swimming pool, or where the site is flat, 3m from any point of the building or swimming pool,
- 6.0 metres - up slope from a building or swimming pool,
- 50.0 metres from any well, bore or dam used or likely to be used for human and or domestic use,
- 50.0 metres from a watercourse, identified on a current series 1:50 000 Department of Environment and Natural Resources topographic map, used or likely to be used for human and or domestic purposes. (refer also to note 4),
- 50.0 metres - from a water source used for agricultural, aquacultural or stock purposes,
- 100.0 metres - from the pool level for the River Murray and Lakes and above the 1956 flood level.

Setback distances for effluent disposal systems installed in coastal foreshore areas should be at least 100 metres from the mean high water mark.

NOTE: *(1) specific provisions of the Development Plan under the Development Act may preclude siting of effluent disposal systems in certain areas. For specific details refer to:*
- *The Mount Lofty Ranges Comprehensive No.2 and amendments,*
- *The Regional Coastal Areas Policies.*

(2) disposal of septic tank effluent is not permitted within the 1956 River Murray and Lakes Flood Zone.

(3) where possible setback distances greater than the above are recommended.

(4) whilst a watercourse is delineated as a blue line on a 1:50 000 topographic map, there are situations where a watercourse exists but is poorly delineated on the 1:50,000 map or is obscured by other detail. Therefore, it is important to ensure that the 50m setback is maintained to prevent contamination of the State's water resources.

(5) specific provisions of the Environment Protection Act and Regulations are applicable for effluent disposal systems installed in "Water Protection Areas" and having a capacity greater than 100 persons.

7.4.3 ON-SITE EFFLUENT DISPOSAL SYSTEMS

SOAKAGE TRENCHES

The common forms of soakage trench used for subsurface effluent disposal are the tunnel system and the perforated pipe system (Figures 12 and 13).

The soakage trench may be installed in a single or multiple runs depending on the length, width and depth of the soakage trench and the length and/or width of the allotment and the direction of landfall. Figures 7, 8, 9, 10 & 20 show examples of different sizes to achieve the requirements for a standard 3 000 litre system with an EPR of 10 litres/m^2 contact area.

Trench dimensions

Width

- the width of the trench may vary between, 1 200mm (minimum) and 2 500mm (maximum) using a single run of plastic tunnel or perforated pipe.

Depth

- using plastic tunnel; 400mm,
- using perforated pipe; 300mm (minimum), 600mm (maximum), being the distance between the bottom of the pipe and trench base.

NOTE: *Unless otherwise stated "Standard Trench Configuration" is 1 200mm width by 400mm depth for a tunnel trench and 1 200mm width by 300mm depth for perforated pipe.*

The effective contact area of a soakage trench includes the combined areas of the base, side and end walls of the trench. A normal effluent disposal system for a residential dwelling with an all waste septic tank sized for up to 6 persons and using an EPR of 10 litres/m^2/day would have a contact area of 90m^2.

EXAMPLE

Trench dimensions for a standard plastic tunnel system are 1 200mm width x 400mm depth.

The contact area for one linear metre is: $1.2 + (0.4 \times 2) \times 1 = 2m^2$.

Length of trench for a standard dimension system serving up to 6 persons and based on an EPR of 10 litres/m^2/day and no other permitted reduction factor is:

Tunnel system				***Perforated pipe system***		
$\frac{90}{2}$	=	45 metres	or	$\frac{90}{1.8}$	=	50 metres

The aggregate size for use in waste control systems detailed in this Standard for soakage trenches, wells, beds and storm water diversion trenches is 40mm. For placement details refer to Figures 12 and 13.

SOAKAGE WELL

The effective contact area of a soakage well is the area of the base and wall, with the diameter of the well taken as the diameter of the excavation and the depth of the well taken as the depth below the inlet. (see Figure 14)

The annular space between the bricks and the wall of the excavation should not be greater than 300mm, and shall be filled with 40mm aggregate, or 25mm aggregate where sandy soils are encountered.

Where it is proposed to construct a soakage well to a depth greater than 2.5 metres, a permit should be obtained from the Water Resources Group, Department of Environment and Natural Resources.

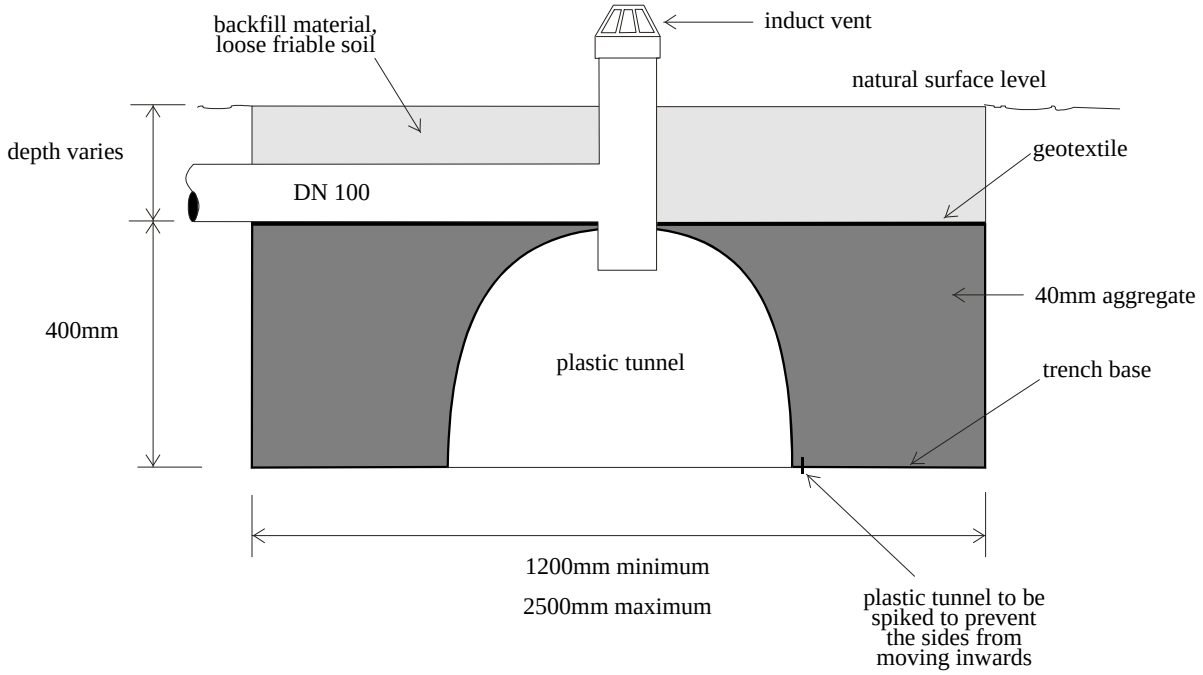


FIGURE 12: TUNNEL SYSTEM

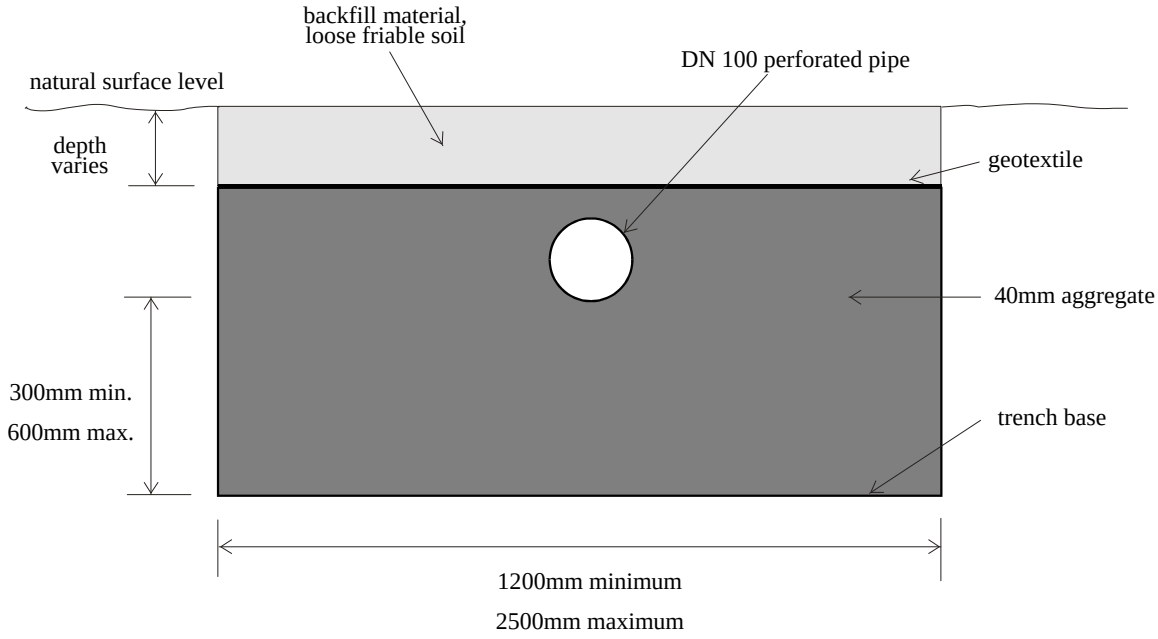
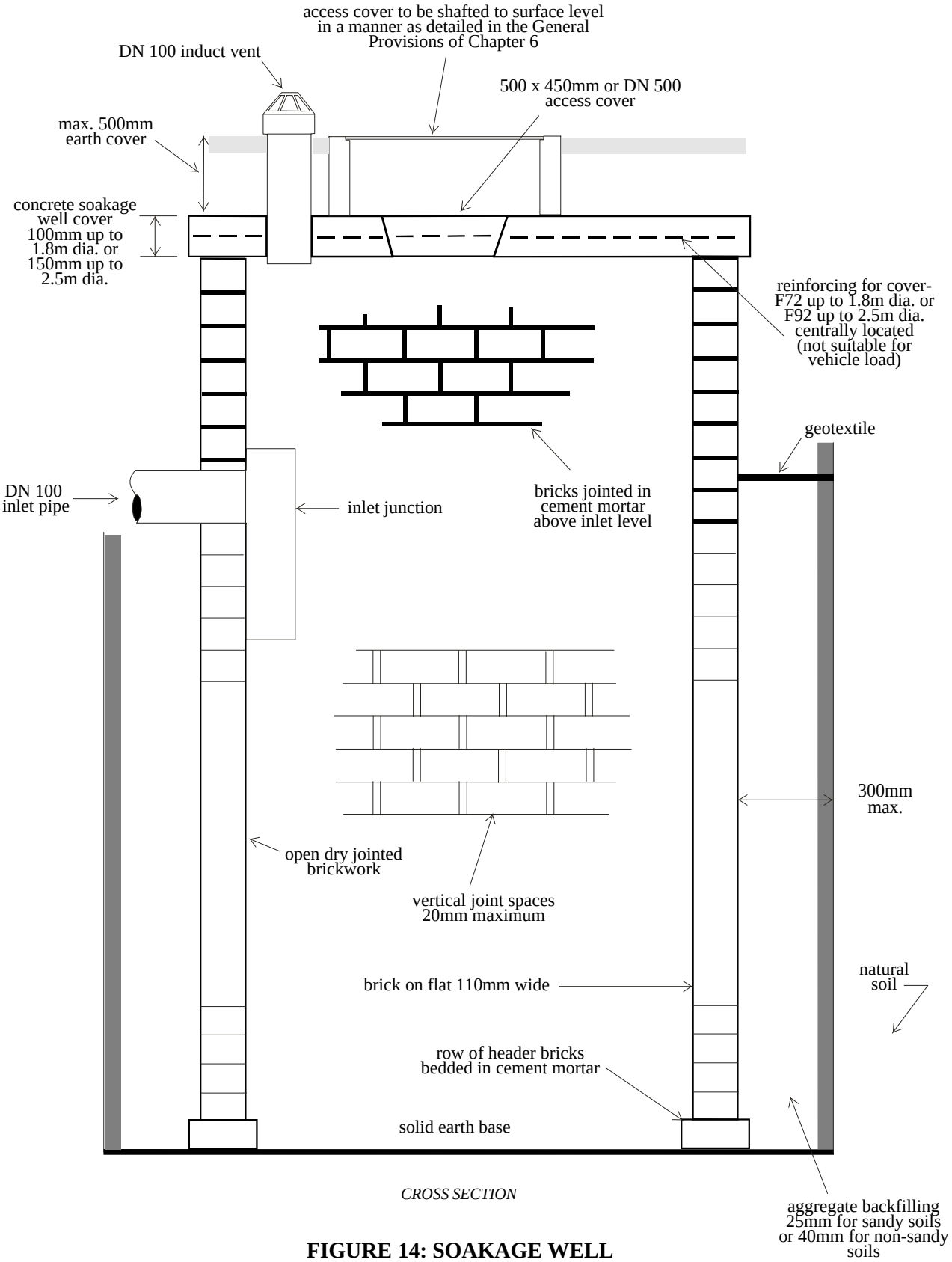


FIGURE 13: PERFORATED PIPE SYSTEM



CROSS SECTION

FIGURE 14: SOAKAGE WELL

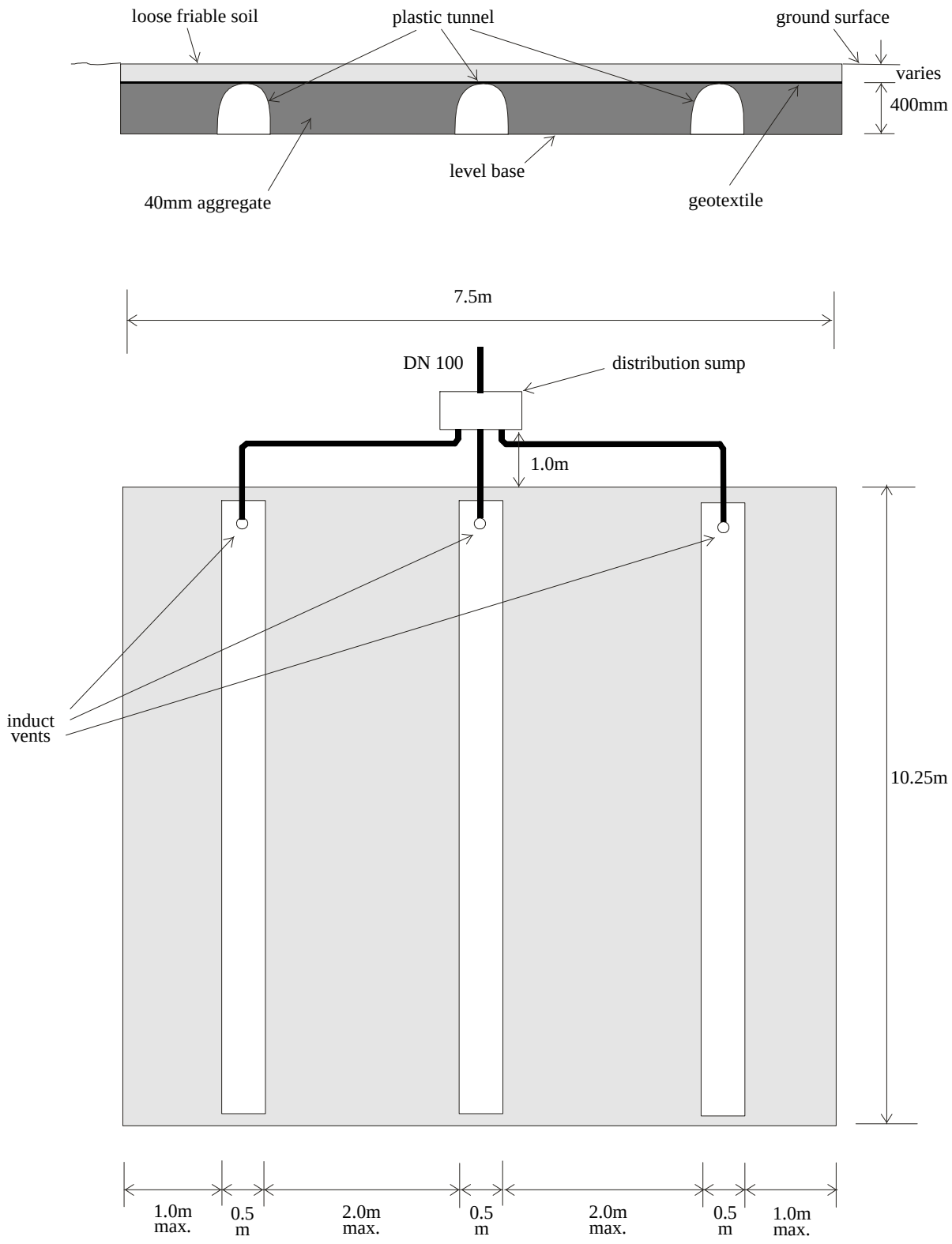


FIGURE 15: SOAKAGE BED

EXAMPLE

To calculate the contact area of the soakage well:

Base = Diameter^2 x 0.7854

Wall = Diameter x 3.1416 x liquid depth

e.g. Diameter 2m, liquid depth 1.9m

Base = 2^2 x 0.7854 = 3.1416

Wall = 2 x 3.1416 x 1.9 = 11.9381

Contact Area = 15.0797m^2

SOAKAGE BED

A soakage bed may be used as an alternative to a soakage trench. This type of soakage system is appropriate only where site gradients are minimal (less than 1%).

The contact area of the soakage bed is the area of the base and walls. The wall area is calculated using a wall height of 400mm for the plastic tunnel system, or 300mm or 600mm for the perforated pipe system.

When positioning the plastic tunnel or perforated pipe within the soakage bed:

- the tunnel or perforated pipes shall be parallel to the longest dimension of the bed and the natural ground contour, and be level,
- parallel runs of tunnel or perforated pipe shall not be more than 2 000mm apart,
- the distance from the edge of the bed to a run of tunnel or perforated pipe shall not be more than 1 000mm,
- the space surrounding the tunnels or to the top of the perforated pipes shall be filled with 40mm aggregate,
- the whole of the constructed bed area shall be covered with geotextile before backfilling with friable soil,
- a distribution sump shall be used to distribute the effluent to each run of tunnel or perforated pipe to provide even distribution over the entire bed.

Figure 15 details a typical soakage bed layout for a 3 000 litre septic tank system.

NOTE: *(1) The relevant authority retains the right to set the requirements for the most appropriate configuration for soakage beds.*

(2) Where a subsurface disposal system is proposed to be constructed in a soil horizon greater than 2 500mm below the surface level, a permit should be obtained from the Water Resources Group, Department of Environment and Natural Resources.

7.5 Off-site disposal

7.5.1 SEPTIC TANK EFFLUENT DISPOSAL SCHEMES (STEDS)

In many South Australian country towns, Councils or the local authority have installed a STEDS for the collection and off-site treatment of septic tank effluent. Where a STEDS is available, application must be made to the relevant authority for approval to connect.

The drain connecting the septic tank to the STEDS shall conform with the requirements of the SA Health Commission Code *Waste Control Systems - Standard for Connection to a Septic Tank Effluent Disposal Scheme (STEDS).*

7.5.2 TEMPORARY CONTAINMENT

Where the site characteristics are unsuitable for the installation of a conventional on-site effluent disposal system or the site is in an area where on-site effluent, treated effluent or reclaimed water disposal is not permitted (e.g. within the 1956 River Murray and Lakes flood zone), containment for disposal at an approved location will be necessary.

NOTE: *(1) The ongoing cost of having effluent carted away to an approved disposal site is high and should be carefully considered before proceeding with this option.*

(2) Persons who undertake development requiring on-site containment for off-site disposal by tanker to an approved disposal site are required to:

- *inform all users of the premises of the requirements,*
- *in the event of sale of the premises, to advise would-be purchasers of the requirements and obligations,*
- *ensure that the system does not overflow or discharge any of the sewage or effluent, treated effluent or reclaimed water onto the site or elsewhere except as approved,*
- *inform all users that any discharge from the system could result in penalties of up to $30,000 or if the discharge is to a water supply (e.g. River Murray and Lakes) up to $60,000.*

Where containment for off-site disposal is to be provided, it shall comply with the following provisions:

- the containment sump shall have an effective capacity equal to at least 4 days daily inflow to the septic tank, and be constructed of reinforced sulphate resisting cement concrete or other material as approved by the SA Health Commission,
- the sulphate resisting cement reinforced concrete containment sump shall be constructed so as to comply with AS 3600 *Concrete Structures* and AS 3735 *Concrete Structures for Retaining Liquids* and as detailed in section 7.6 *Ancillary Structures*,
- there shall be no structural failure or undue distortion of the sump - empty or full - due to hydrostatic or other pressure when placed in situ,
- it shall be designed to withstand any loading imposed by vehicles, adjoining structures or surrounding soils,
- there will be no structural failure or cracking of the prefabricated containment sump when transported and lifted into the excavation,
- it shall be installed on a solid base and be level,
- it shall be provided with a cover that is fitted so as to be watertight and have an access opening and cover of at least 500 x 450mm or DN 500 terminating at surface level,
- where it is not practical to terminate the top cover at surface level the access opening shall be shafted to the surface level in a manner as detailed in Section 6.2 "*General Provisions*" of Chapter 6.
- it shall be provided with a DN 100 inspection opening/pump out opening fitted with a threaded access cap and concrete block and cover. Where the sump cover is not at ground level, the inspection opening/pump out opening shall be shafted to surface level,
- it shall be provided with an audible and visible alarm with muting facilities for the audible component and be located in a conspicuous position in either the laundry or kitchen to warn that the sump requires pumping out within 24 hours,
- it shall be provided with an automatic system that shuts down the water supply to the premises when the sump liquid level is within 100mm of the invert of the inlet pipe,
- it shall be fitted with a DN 100 induct vent either located on the inlet pipe to the sump or on the sump cover,
- all pipework/connections shall be made using PVC collars cast into the wall and the lid of the pump sump,
- all connections and joints shall be waterproof,

- it shall be located so as to permit access for the pump out vehicle,
- setback distances for containment sumps are the same as for septic tanks.

Where the relevant authority permits the installation of a containment sump for off-site disposal at an approved site it will require the owner/occupier of the premises to provide signed documents:

- confirming agreement that the effluent will only be disposed of at the approved site,
- confirming arrangements between the owner/occupier and an effluent removal contractor for removal of the effluent and disposal at the approved site,
- ensuring the removal contractor will provide copies of cartnotes of such removals and disposal to the relevant authority and such other authorities as required e.g. Water Resources Group, Department of Environment and Natural Resources.

The relevant authority may approve alternative arrangements other than removal by tankerage subject to the arrangements not being in conflict with the requirements detailed in this Standard and/or other agencies referred to in this Standard.

Alternative arrangements may include pumping to a sewer, STEDS or an effluent disposal system located on another site owned by the owner of the generating site or a site where there is a permanent legal binding arrangement between both parties and this arrangement is acceptable to the relevant authority.

7.6 Ancillary structures

7.6.1 DISTRIBUTION SUMP

Where multiple trenches, wells or bed systems are used to dispose of effluent it is necessary to install a distribution sump, see Figure 16.

The distribution sump has two purposes; firstly, to provide a means of distributing the effluent evenly to the entire soakage system, secondly, to provide a means of alternating flow to sections of the soakage system (refer to Figures 16 and 17). Other devices are available for alternating flows to split soakage systems e.g. PVC diverter valve.

Alternating the flow to each trench or well allows resting of sections of the soakage system, and this has been shown to increase the effective life of the disposal system.

Should the method of alternating the flows to the various sections of the disposal system be used, it will be necessary to closely monitor the flow initially, to determine the duration of flow the section can handle before backflow or surcharge occurs.

When the inflow exceeds the capacity of soil to handle the hydraulic load, it will be necessary to isolate that section and re-direct the effluent to another section. Seasonal conditions may have an impact on the duration of operation of the respective sections.

For example, in a standard system for 6 persons using 45 metres of tunnel trench, split into three 15 metres lengths, the period of discharge to each section would be approximately 7 days. This is based on the capacity of the soakage trench and an EPR of 10 litres/m^2/day. Longer periods may be used where the soil permits and is not limited by the biomass.

The distribution sump shall be:

- constructed from sulphate resisting reinforced cement concrete or other approved material,
- all pipework connections shall be made using PVC collars cast into the walls of the sump,
- installed on a solid level base and not be subject to vehicle loads,
- the sump shall be waterproof and be finished at ground surface level with a removable cover to permit diversion control,
- the level of the outlet pipes shall be at least 50mm below that of the inlet pipe.

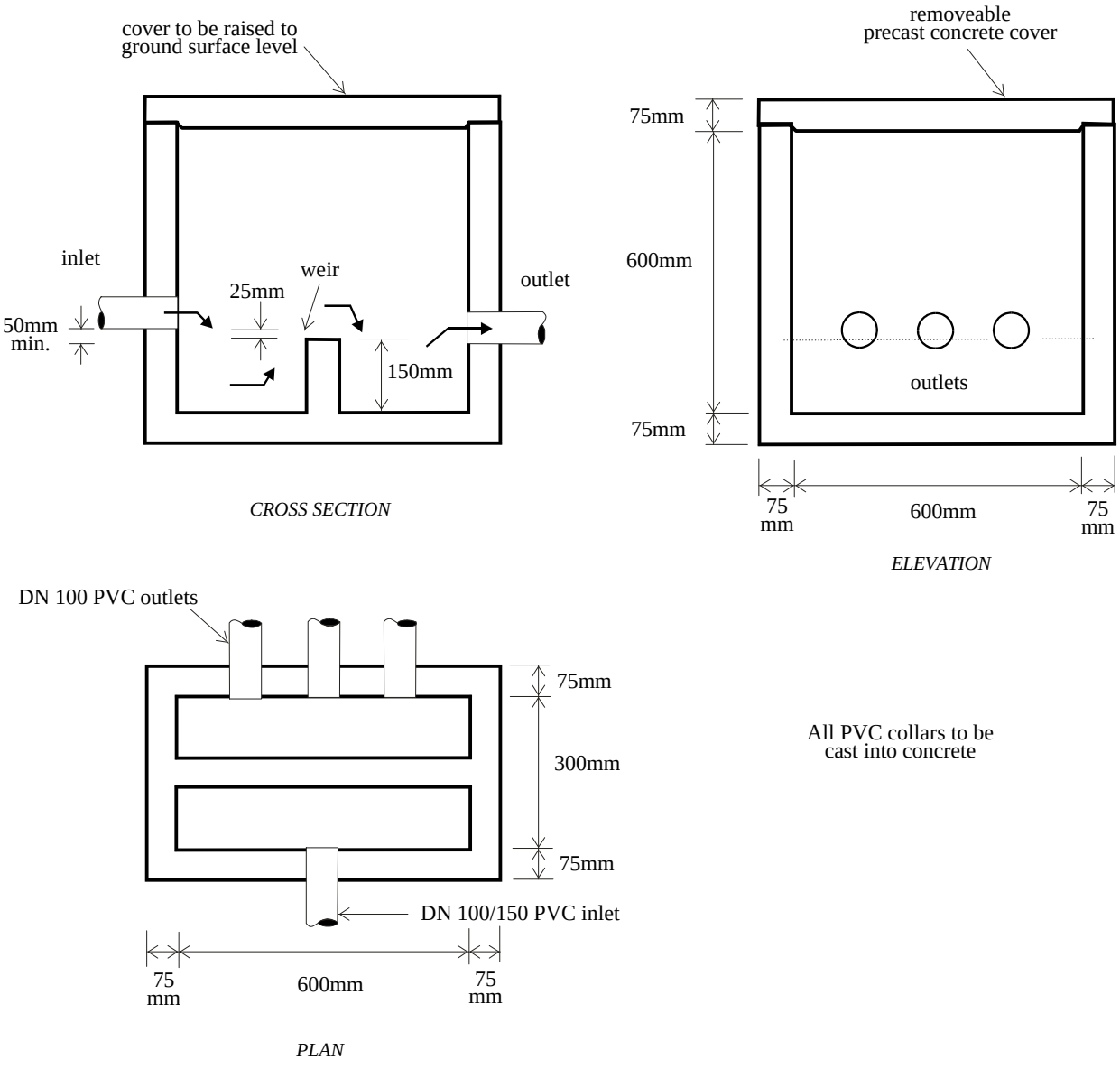


FIGURE 16: TYPICAL DISTRIBUTION SUMP

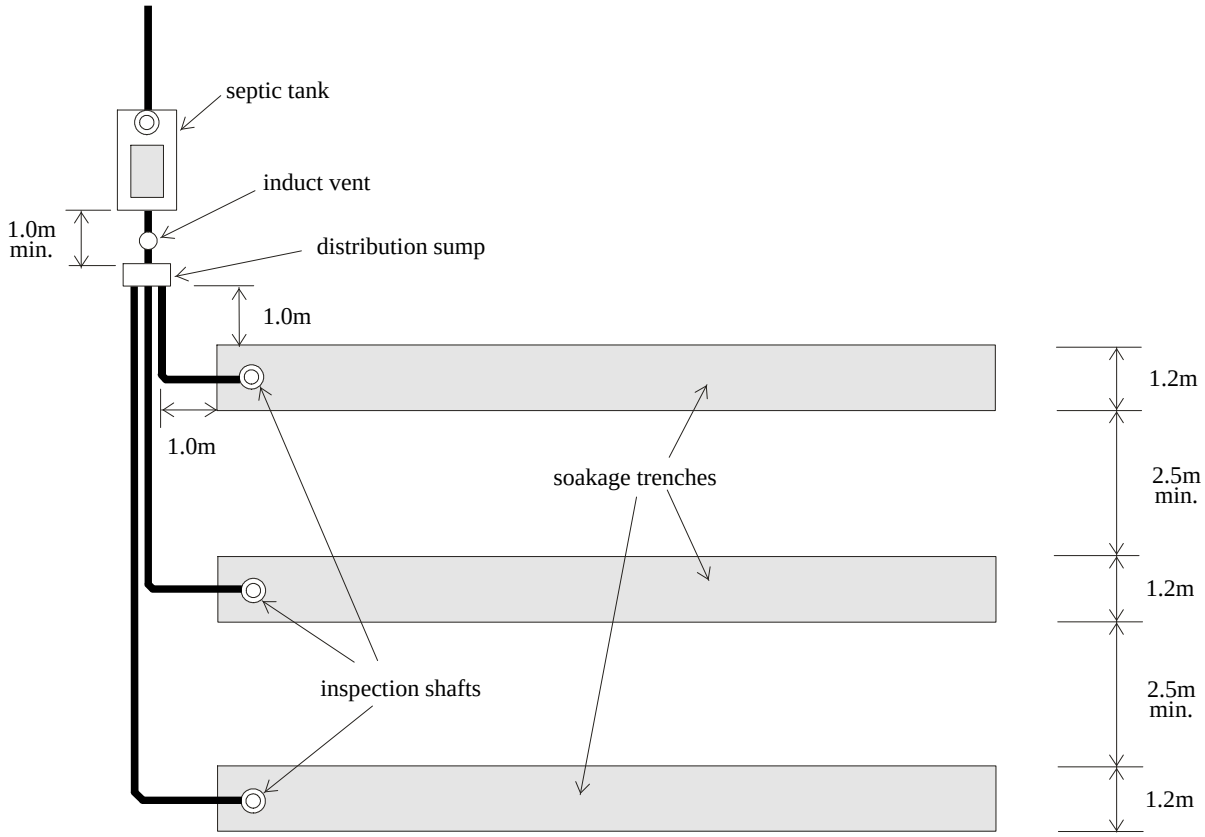


FIGURE 17: DISTRIBUTION SUMP / TRENCH LAYOUT

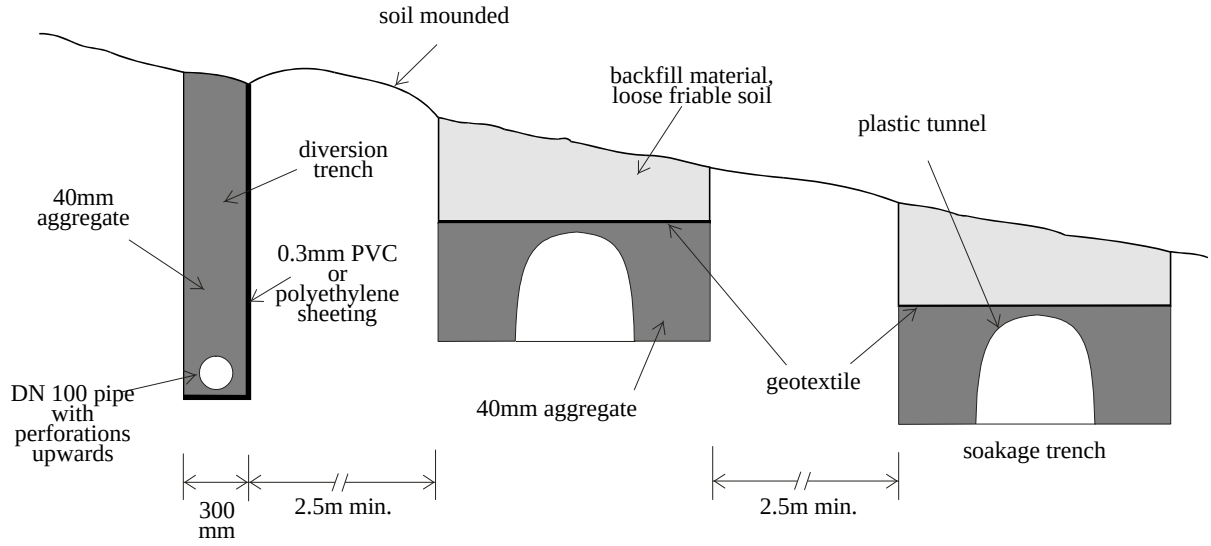
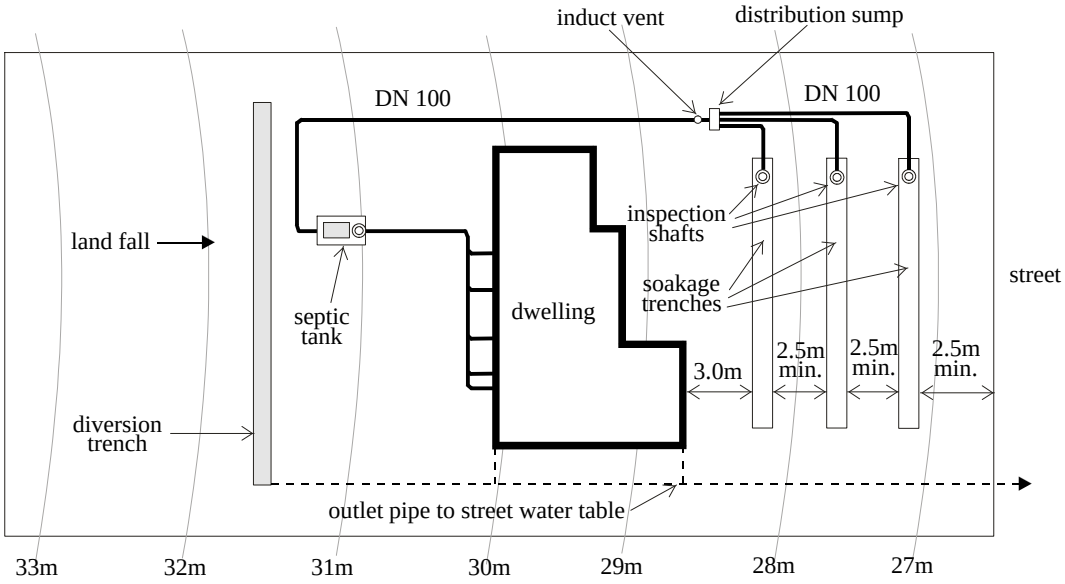


FIGURE 18: DIVERSION & SOAKAGE TRENCH SECTION



NOTE: Building set back to allow for installation of effluent system

FIGURE 19: DIVERSION / ROOF WATER DISPOSAL LAYOUT

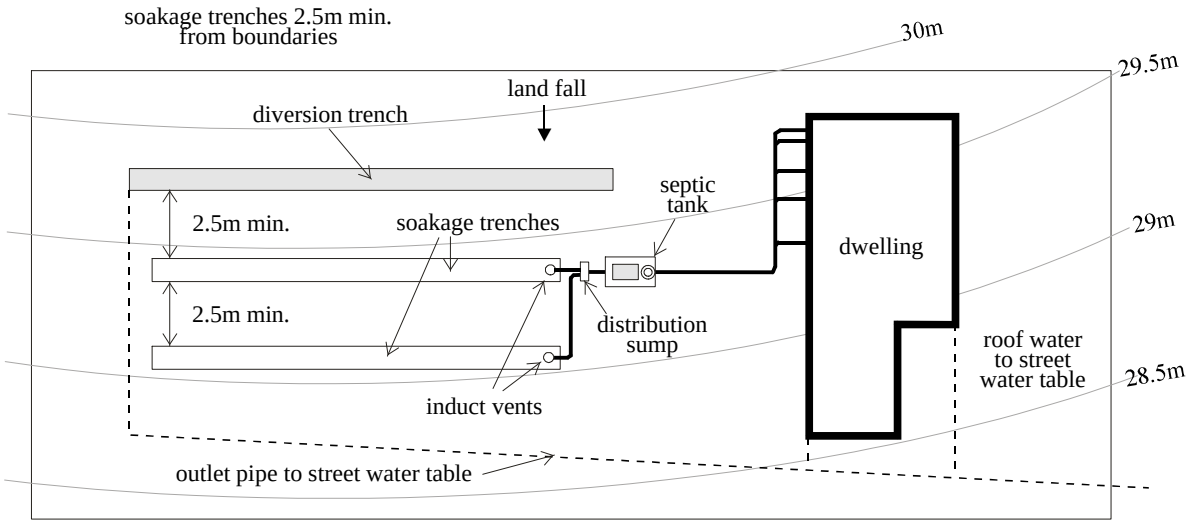


FIGURE 20: DIVERSION / ROOF WATER DISPOSAL LAYOUT

The sump shall contain an inlet stilling chamber and a weir or other means of regulating the flow of effluent. The overflow level of the weir shall be below the inlet level, and the weir and the outlets shall be in a parallel plane and installed level.

The sump shall be installed in accordance with the following setback distances:

- 1 metre from the septic tank and effluent disposal system,
- 2.5 metres from buildings and boundaries.

7.6.2 DIVERSION TRENCH

Migrating surface and subsurface water can affect the capability of the soakage system to dispose of the effluent.

Where the land fall and/or the geotechnical evidence indicates actual or potential ground water movement a diversion trench will be required.

The diversion trench shall be installed so that surface and subsurface water is diverted away from the disposal area.

Where the site is flat, it is not practical to install a diversion trench.

On some sites the diversion trench should be located upslope from the building and be of a depth that will arrest migrating subsurface water flow that may affect the disposal system (see Figure 19). In this case, it is unlikely that the depth will be below the base of the soakage trench.

Diversion trench construction

(See Figures 18 to 20)

The diversion trench shall comply with the following requirements:

- the base of the diversion trench should be deeper than the effluent disposal system base,
- the diversion trench shall be lined with 0.3mm PVC or polyethylene placed on the trench bottom and the side nearest to the effluent disposal system and be extended to the ground surface level,
- a DN 100 or other approved perforated pipe with the perforations facing upward shall be placed on the top of the PVC or polyethylene sheeting located at the base of the trench,
- the trench shall be filled with 40mm aggregate to the surface level,
- the soil shall be mounded between the diversion and soakage trench, refer to Figure 18,
- the outlet from the perforated pipe shall be extended to discharge at ground surface level at a point downslope from the subsurface soakage system,
- the diversion trench width shall be 300mm minimum.

7.6.3 ROOF WATERS

All roof waters shall be diverted away from the effluent disposal area. Where practical, roof waters should be diverted to the street water table or to a point beyond the disposal area so that it has no impact on the operation of the disposal system. (see Figures 19 and 20).

7.6.4 PUMP SUMP & PUMP

Where the geotechnical evidence indicates optimum soil permeability at a level higher than the septic tank outlet, it is necessary to pump the effluent.

Pump sump construction

Pump sump construction shall comply with the following requirements:

- the sulphate resisting cement reinforced concrete pump sump shall be constructed so as to comply with AS 3600 *Concrete Structures* and AS 3735 *Concrete Structures for Retaining Liquids* and as detailed in Section 7.6, *Ancillary Structure*,
- there shall be no structural failure or undue distortion of the sump, empty or full, due to hydrostatic or other pressures when placed in situ,

- be designed to withstand any loading imposed by vehicles, adjoining structures or surrounding soils,
- there will be no structural failure or cracking of the prefabricated pump sump when transported and lifted into the excavation,
- it shall be installed on a solid base and be level,
- be provided with a cover that is fitted so as to be watertight and have an access opening and cover of at least 500 x 450 mm or DN 500 terminating at surface level,
- where it is not practical to terminate the top cover at surface level the access opening shall be shafted to the surface level in a manner as detailed in Section 6.2, *General Provisio*",
- be provided with a DN 100 inspection opening fitted with a threaded access cap, concrete block and cover. Where the pump sump cover is not at ground level the inspection opening shall be shafted to surface level,
- be fitted with a DN 100 induct vent either located in the inlet pipe to the pump sump or on the pump sump cover,
- all connections and joints shall be waterproof,
- setback distances are the same as for septic tanks,
- minimum liquid capacity shall be 500 litres or 50% of the daily inflow, whichever is the greater,
- all pipework connections shall be made using PVC collars cast into the walls and lid of the pump sump.

Pump

The pump shall:

- be constructed from materials suitable for pumping septic tank effluent and may be an above ground or submersible type,
- have a capacity to discharge the maximum daily flow against any physical or imposed head,
- be statically mounted and protected from the elements and be wired to operate automatically,
- the electrical work shall be carried out to the requirements of the Supply Authority Service Rules and AS 3000 SAA *Wiring Rules*,
- the pipework associated with connection of the pump shall be made with approved material in a workmanlike manner,
- be provided with an audible and visible alarm with muting facilities for the audible component and be in a conspicuous position within the kitchen or laundry to warn of pump failure and high-water level.

7.6.5 STANDARD FOR CEMENT CONCRETE

Cement concrete used in the construction or installation of diversion, containment and pump sumps shall be of the sulphate resisting type and comply with AS 3600 *Concrete Structures* and AS 3735 *Concrete Structures for Retaining Liquids* and shall have a compressive strength of not less than 25 MPa at 28 days.

8 SYSTEM VENTING

The septic tank system shall be vented in accordance with the National Plumbing Code, AS 3500-2, *Sanitary Plumbing and Sanitary Drainage* and be provided with a DN 100 induct vent for each septic tank. The induct vent is not required where connection is made to a septic tank effluent disposal scheme.

The induct vent shall have a removable cap and be at least 200mm above ground. It may be positioned on the inlet point of the soakage system to provide a location and inspection point.

Where the disposal system induct vent is situated on land subject to flooding, i.e. a 10 year return period flood event, the induct vent should be raised to above the flood level.

Where multiple runs of soakage trench are installed, an induct vent is required on each run, or alternatively, the induct vent may be positioned on the inlet pipe to the distribution sump with a DN 100 inspection shaft finished with a threaded access cap and concrete block and cover on each run of soakage trench.

Where the effluent is pumped to the subsurface disposal area, the induct vent shall be located on the inlet pipework to the pump sump or in the pump sump cover.

All vents shall be made mosquito proof by use of a non ferrous mesh formed with 0.315mm diameter material with 6 x 7 mesh openings per cm^2 fitted so as to be visible.

9 DESLUDGING THE SEPTIC TANK

The effective operation of any septic tank is dependent upon the nature and quantity of the daily flow. The use of disinfectants, sanitisers and household cleaners can adversely affect the bacterial action within the septic tank, and as a result, the sludge/scum accumulation rate will vary according to individual use and conditions.

When correctly sized and maintained, the septic tank provides adequate capacity for the retention of the sludge and scum for further primary treatment, and ensures a 24 hour retention of the hydraulic load to enable settlement. Where the retention period is less than 24 hours, the amount of solids in suspension increases and results in the discharge of excessive amounts of solids to the effluent disposal systems. This additional organic load can contribute to system failure.

The sizes of septic tanks specified for single and multiple residential dwellings have been so designed that desludging is necessary every four years.

Septic tanks for non-residential premises may be designed to allow a period between one and four years before desludging and thereafter they need to be desludged in accordance with the approval conditions. Refer to Section 5.5, *Septic tank capacities for non-residential premises* in Chapter 5 for details.

An effective maintenance program should include annual checking to ensure a free capacity equal to one third of the effective liquid depth within the detention zone as measured in the first compartment. If the accumulation of sludge and scum has decreased the capacity below this level, then the tank needs desludging.

For information on the disposal of septic tank sludge, contact the Environmental Health Officer at the local council office for the area, or the SA Health Commission for areas not subject to local government control.

NOTE: *All access openings must be maintained so as to be gas and watertight.*

10 ALTERNATIVE SYSTEMS

10.1 Product & system approval

Under the provisions of the Public and Environmental Health (Waste Control) Regulations SA Health Commission general approval is required for the supply and/or manufacture of a waste control system or appliance, product or process to be used in a waste control system in South Australia. Specific site installation approval is also required from the relevant authority for the area where the waste control system is to be installed.

Waste Control Systems not covered by a SA Health Commission Standard need to be submitted to the SA Health Commission for approval to use and for installation.

10.2 Aerobic systems

A range of alternative waste control systems have been developed for use in situations where conventional sub-surface effluent disposal systems are not appropriate.

Aerobic systems may incorporate a number of treatment steps including:

- a primary settling chamber (septic tank),
- an aeration chamber,∗
- a clarification chamber with sludge return to the aeration or primary settling chamber,∗
- a disinfection chamber,
- disposal of reclaimed water by means of surface or sub-surface irrigation.

∗ not applicable for sand filters.

For further information on the types of systems approved by the SA Health Commission for installation in South Australia contact the Environment Health Officer at the local council office for the area, or the SA Health Commission for areas not subject to local government control.

Details on the installation of and/or the manufacture of aerobic sand filters and aerobic wastewater treatment systems can be obtained by referring to the SA Health Commission Code, *Waste Control Systems - Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia*:

SUPPLEMENT A *Aerobic Sand Filters*,

SUPPLEMENT B *Aerobic Wastewater Treatment Systems*.

10.3 Disposal of sullage wastewater

Information on the requirements for the disposal of sullage wastewater can be obtained from the SA Health Commission publication *Waste Control Systems - Standard for the Installation, Operation and Maintenance of Sullage Wastewater Collection and Treatment System*s.

Persons intending to install a sullage wastewater system are advised to discuss the proposal with the Environmental Health Officer at the local council office for the area, or the SA Health Commission for areas not subject to local government control, to determine if compulsory all waste septic tank resolutions apply or if sullage wastewater systems are permitted.

11 TABLES

TABLE 1: Determining capacity of septic tank based on use conditions

The following data is provided to assist with determining the capacity of the septic tank based on use conditions. In some cases it may require the addition of a range of uses to obtain the total capacity. Where the specific use is not listed, it may be necessary to select a similar use to determine the capacity.

The rates listed below should be used, except in situations where actual rates have been determined from appropriate monitoring of the sludge scum accumulation rate and water meter readings that exclude non septic tank use, i.e. garden, swimming pool, evaporative cooling etc.

The term ***average*** *or* ***highest daily number*** *over an "**x**" day period* means the highest number in any 12 month period.

Premises	***Fixtures***	***Sludge / scum rate***		***Daily inflow rate***	
		Number of persons	*Rate: litres/ person/year*	*Number of persons*	*Rate: litres/ person/day*
		P1	**S**	**P2**	**D.F.**
NOTE: Calculate each use and add to obtain total capacity					
CARAVAN PARKS					
Permanent Occupation	wc/urinal basin bath/shower laundry kitchen sink	Total number of sites x 3.5	80	Total number of sites x 3.5	150
Casual Occupation	wc/urinal basin bath/shower kitchen sink laundry	Average number of sites occupied per year x 3.5	48	Total number of sites x 3.5	100
CHILD DAY CARE CENTRES					
	wc/urinal basin bath/shower kitchen sink laundry	Total number of children and staff	48	Total number of children and staff	50 if in-house laundry service 35 if external laundry service
CHURCHES, PUBLIC HALLS etc.					
	wc/urinal basin kitchen sink (tea service area only)	Average daily number over 7 day period	25 up to 4 days use/ week 40 over 4 days use/week	Highest daily number over 7 day period	8
Addition:	where kitchen area provided for catering		Add 10 to either of above		Add 5 to above

TABLE 1 (cont.)

Premises	*Fixtures*	*Sludge / scum rate*		*Daily inflow rate*	
		Number of persons	*Rate: litres/ person/year*	*Number of persons*	*Rate: litres/ person/day*
		P1	**S**	**P2**	**D.F.**
NOTE: Calculate each use and add to obtain total capacity					
CLUBS					
Membership entry only. Members/guests & staff using facilities	wc/urinal basin bath/shower kitchen sink (tea service area only)	Average daily number over 7 day period	35	Highest daily number over 7 day period	30
Licensed area Bar trade only	wc/urinal basin bar sink glass washer	Average daily number over 7 day period	5	Highest daily number over 7 day period	10
Licensed bar & restaurant/ meals area	wc/urinal basin kitchen sink dishwasher	Average daily number over 7 day period	10	Highest daily number over 7 day period	15
COFFEE / TEA SHOPS / KIOSKS					
e.g. light refreshments and prepared food, cakes etc.	wc/urinal basin kitchen sink	Average daily number over 7 day period	30	Highest daily number over 7 day period	10
CONSTRUCTION CAMPS - TEMPORARY					
	wc/urinal basin shower laundry kitchen sink dishwasher	Total number of persons using facilities	80 x by number of years to be used	Total number of persons using facilities	150
HOLIDAY CAMPS					
e.g. scout, youth & church centres with casual occupation	wc/urinal hand basin shower kitchen sink	Total number of beds (single equivalent)	48	Highest daily number using facilities	100
(staff and or residential caretaker data to be included where applicable)					

TABLE 1 (cont.)

Premises	***Fixtures***	***Sludge / scum rate***		***Daily inflow rate***	
		Number of persons	*Rate: litres/ person/year*	*Number of persons*	*Rate: litres/ person/day*
		P1	**S**	**P2**	**D.F.**
NOTE: Calculate each use and add to obtain total capacity					
HOSPITALS & NURSING HOMES					
Accommodation and resident staff	wc/urinal basin bath/shower laundry kitchen sink dishwasher	Total number or beds plus resident staff	80	Total number of beds plus resident staff	150
Non resident staff	wc/urinal basin kitchen sink (tea service area only)	Number of employee's per shift x number of shifts	25	Number of employee's per shift x number of shifts	30
	with shower			as above	10
HOTELS / MOTELS / LIVE IN CONFERENCE CENTRES					
Accommodation	wc/urinal basin bath/shower kitchen sink laundry	Total number of beds (single equivalents)	48	Total Number of beds (single equivalents)	100
Permanent residents staff etc.	wc/urinal basin bath/shower kitchen sink laundry	Total number of live in staff	80	Total Number of live in staff	150
Bar trade	wc/urinal basin bar sink glass washer	Average daily number attending in 7 day period	5	Highest daily number over 7 day period	10
Dining room lounge area non-resident use	wc/urinal basin kitchen sink dishwasher	Average daily number of diners per 7 day period	10	Highest daily number over 7 day period	15
Non resident staff	wc/urinal basin kitchen sink (tea service area only)	Number of employee's per shift x number of shifts	25	Number of employee's per shift x number of shifts	30
	with shower			as above	10

TABLE 1 (cont.)

Premises	*Fixtures*	*Sludge / scum rate*		*Daily inflow rate*	
		Number of persons	*Rate: litres/ person/year*	*Number of persons*	*Rate: litres/ person/day*
		P1	**S**	**P2**	**D.F.**
NOTE: Calculate each use and add to obtain total capacity					
MEDICAL CONSULTING ROOMS					
e.g. doctors dentist etc. staff	wc/urinal basin kitchen sink (tea service area only)	Number of persons using system per shift x number of shifts	40	Number of persons using system per shift x number of shifts	30
	with shower			as above	10
Consulting rooms		Per consulting room	80	Per consulting room	100
PUBLIC SWIMMING POOLS					
including kiosk e.g. take away food	wc/urinal basin shower kitchen sink (tea service area only)	Average daily number over 7 day period	20	Highest daily number over 7 day period	20
PUBLIC TOILETS					
	wc/urinal basin	Average daily number over 7 day period	20	Highest daily number over 7 day period	5
Addition:	where shower provided	as above	5	as above	10
RESTAURANTS					
No liquor licence	wc/urinal basin kitchen sink dishwasher	Average daily number over 7 day period plus staff	35	Highest daily number over 7 day period plus staff	15
With liquor licence	wc/urinal basin kitchen sink dishwasher glass washer	Average daily number over 7 day period plus staff	35	Highest daily number over 7 day period plus staff	20

TABLE 1 (cont.)

Premises	*Fixtures*	*Sludge / scum rate*		*Daily inflow rate*	
		Number of persons	*Rate: litres/ person/year*	*Number of persons*	*Rate: litres/ person/day*
		P1	**S**	**P2**	**D.F.**
NOTE: Calculate each use and add to obtain total capacity					
REST HOMES, BOARDING & LODGING HOUSES					
Accommodation and resident staff	wc/urinal basin bath/shower laundry kitchen sink	Total number of beds plus resident staff (single equivalents)	80	Total number of beds plus resident staff (single equivalents)	150
Non resident staff	wc/urinal basin kitchen sink (tea service only)	Number of employee's per shift x number of shifts	25	Number of employee's per shift x number of shifts	30
	with shower			as above	10
ROAD-HOUSES / SERVICE STATIONS					
Staff	wc/urinal basin kitchen sink (tea service area only)	Number of employee's per shift x number of shifts	25	Number of employee's per shift x number of shifts	30
	with shower			as above	10
Public toilets	wc/urinal basin	Average daily number over 7 day period	20	Highest daily number over 7 day period	5
	with shower	as above	5	as above	10
Restaurant take away and sit down meals	wc/urinal basin kitchen sink dishwasher	Average daily number over 7 day period	10	Highest daily number over 7 day period	10
SCHOOLS & KINDERGARTENS					
Including kiosk facilities e.g. take away food	wc/urinal basin kitchen sink	Total number of students plus staff	25	Total number of students plus staff	20
Where canteen facilities provided e.g. plated hot and cold meals	kitchen sink dishwasher	as above	10	as above	5
	with shower			per 100 students	100

TABLE 1 (cont.)

Premises	*Fixtures*	*Sludge / scum rate*		*Daily inflow rate*	
		Number of persons	*Rate: litres/ person/year*	*Number of persons*	*Rate: litres/ person/day*
		P1	**S**	**P2**	**D.F.**
NOTE: Calculate each use and add to obtain total capacity					
SEMINAR / CONFERENCE ROOMS					
No meals	wc/urinal basin kitchen sink (tea service area only)	Total seating capacity plus staff	25	Total seating capacity plus staff	30
Meals No liquor licence	wc/urinal basin kitchen sink dishwasher	Total seating capacity plus staff	35	Total seating capacity plus staff	35
Meals with liquor licence	wc/urinal basin kitchen sink dishwasher glass washer	Total seating capacity plus staff	35	Total seating capacity plus staff	40
SHOPPING CENTRES					
Staff	wc/urinal basin kitchen sink (tea service area only)	Number of employee's per shift x number of shifts	25	Number of employee's per shift x number of shifts	30
Public	wc/urinal basin	average daily number over 7 day period	20	Highest daily number over 7 day period	5
Shop Facilities	double bowl sink basin	Per shop	20	Per shop	40
Supermarket	double bowl sink basin cleaners sink	Per supermarket	40	Per supermarket	500
SPORTS CENTRES					
e.g. health and fitness clubs squash courts indoor cricket basketball	wc/urinal basin shower kitchen sink (tea service area only)	average daily number over 7 day period plus staff	25	Highest daily number over 7 day period	40

TABLE 1 (cont.)

Premises	***Fixtures***	***Sludge / scum rate***		***Daily inflow rate***	
		Number of persons	*Rate: litres/ person/year*	*Number of persons*	*Rate: litres/ person/day*
		P1	**S**	**P2**	**D.F.**
NOTE: Calculate each use and add to obtain total capacity					
STAFF ABLUTIONS, WORK PLACE INSTALLATIONS					
e.g. factories commercial office	wc/urinal basin kitchen sink (tea service area only)	number of employee's per shift x number of shifts	25	Number of employee's per shift x number of shifts	30
	with shower			as above	10
Where canteen facilities provided for kiosk meals e.g. pies, pasties, sandwiches	kitchen sink			as above	2
Where plated meals provided e.g. hot/cold meals prepared onsite	kitchen sink dishwasher	as above	10	as above	5
WINE TASTING					
	wc/urinal basin kitchen sink glass washer	average daily number over 7 day period	5	Highest daily number over 7 day period	8
staff			25		30

TABLE 2

Construction requirements for cast in situ concrete septic tanks

See Chapter 6, Figure 5.

Effective tank capacity	***Dimensions mm***				***Reinforcement fabric***			***Concrete thickness mm***		
	A	*B*	*C*	*D*	*Rw (Wall)*	*Rc (Cover)*	*Rf (Floor)*	*Walls*	*Cover*	*Floor*
3000	2000	1000	1000	1000	F72	F72	F72	100	130	130
4000	2200	1100	1100	1100	F82	F72	F82	130	130	140
5000	2400	1200	1200	1200	F82	F82	F82	140	130	150
6000	2800	1400	1200	1200	F82	F82	F82	140	130	150
7000	3000	1500	1300	1200	F82	F82	F82	140	140	150
8000	3000	1500	1400	1300	F92	F92	F92	150	150	150
9000	3000	1500	1400	1450	F92	F92	F92	150	150	150
10000	3000	1500	1500	1500	F92	F92	F92	150	150	150

TABLE 3

Determination of Effluent Percolation Rate (EPR)

Classification	*Test Percolation Rate mm/hr*	*Method of Determination*	*Effluent Percolation Rate (EPR) litres/m^2/day*
Indirect assessment			
by soil type AS 1726 Appendix A, Table A1			
Good soakage SP, GP, GW	Not applicable	Indirect	15
Poor soakage SC, SM, SP SW, GC, GM	Not applicable	Indirect	10
Practically impermeable Pt, OH, CH, MH OL, CL, CI, ML	As determined by percolation testing	Direct	* Subject to calculation from percolation test results.
Direct assessment			
by percolation testing	From 10 to 14	Direct	* Subject to calculation from percolation test results.
	From 15 to 23	Direct	10
	From 24 to 150	Direct	15

*

(1) Where the test percolation rate is less than 15mm/hr the EPR of 10 litres/m^2/day shall be reduced by 1.5 litres/m^2/day for every 1mm reduction in the test percolation rate.
(2) In situations where the EPR is less than 10 litres/m^2/day the total daily in-flow rates should be divided by the calculated EPR to determine the minimum contact area required for the disposal system.
(3) The information contained in Tables 6, 7, 8 and 9 cannot be used where the EPR is less than 10 litres/m^2/day.

NOTES:

- *The "percolation rate" determined by direct assessment (percolation testing) is derived using clean water;*
- *The "effluent percolation rate" is the adjusted figure to compensate for the difference between clean water and septic tank effluent having a high biological load which forms on the soil surface and pores as a biomass and results in a long term absorption rate;*
- *Thus a 15mm/hr percolation rate equates to an effluent percolation rate of 10mm/m^2 day or 10 litres/m^2/day;*
- *By way of example, a percolation rate of 9mm/hr would require a very large sub-surface disposal system (standard trench dimensions) as follows:*
  - *percolation rate: 15mm less 9mm = 6*
  - *percolation rate to EPR factor = 6mm(PR) x 1.5 litres/m^2/day (EPR) = 9 litres/m^2/day EPR factor*
  - *effluent percolation rate of 10 litres/m^2/day less 9 litres/m^2/day EPR factor = 1 litre/m^2/day EPR*
  - *contact area: 900 litres ÷ 1 litre/m^2/day EPR = 900m^2*
  - *disposal system requirements (standard dimensions tunnel system); 900m^2 ÷ 2m^2/lineal metre = 450metres (10 times the amount for soil with an EPR of 15mm).*

TABLE 4

All waste systems

*Type of water supply**	*Daily in-flow rate (DF) litres/person/day*	*Effluent percolation rate (EPR) ** litres/m^2/day*	*Table reference to establish minimum requirements*
Reticulated	150	10	6
Reticulated	150	15	7
Roof catchment storage or carted	125	10	8
Roof catchment storage or carted	125	15	9

* Where the status of the water supply changes, the system will need to be upgraded to comply with the supply criteria.

** Effluent Percolation Rates are subject to determination in accord with Table 3 provisions.

TABLE 5

Sewage (WC) only systems

*Type of water supply**	*Daily in-flow rate (DF) litres/person/day*	*Effluent percolation rate (EPR) ** litres/m^2/day*	*Table reference to establish minimum requirements*
Reticulated	50	10	6
Reticulated	50	15	7
Roof catchment storage or carted	40	10	8
Roof catchment storage or carted	40	15	9

* Where the status of the water supply changes, the system will need to be upgraded to comply with the supply criteria.

** Effluent Percolation Rates are subject to determination in accord with Table 3 provisions.

TABLE 6

Effluent disposal requirements using EPR of 10 litres/m^2/day, Reticulated supply

	Plastic Tunnel	*Perforated Pipe*	*Soakage Well*	*Soakage Bed*	*Containment On-site*
Unit	***Metres***	***Metres***	***m^2 contact area***	***m^2 contact area***	***Litres***
RESIDENTIAL DWELLING					
All Waste (150 l/p/d)					
min. 6 persons	45	50	90	90	3600
plus					
For each additional 2 persons	15	17	30	30	1200
Sewage Only (50 l/p/d)					
min. 6 persons	15	17	30	30	1200
plus					
For each additional 2 persons	5	6	10	10	400

TABLE 7

Effluent disposal requirements using EPR of 15 litres/m^2/day, Reticulated supply

	Plastic Tunnel	*Perforated Pipe*	*Soakage Well*	*Soakage Bed*	*Containment On-site*
Unit	***Metres***	***Metres***	***m^2 contact area***	***m^2 contact area***	***Litres***
RESIDENTIAL DWELLING					
All Waste (150 l/p/d)					
min. 6 persons	30	33	60	60	3600
plus					
For each additional 2 persons	10	11	20	20	1200
Sewage Only (50 l/p/d)					
min. 6 persons	10	11	20	20	1200
plus					
For each additional 2 persons	4	5	8	8	400

TABLE 8

Effluent disposal requirements using EPR of 10 litres/m^2/day, Roof catchment

	Plastic Tunnel	*Perforated Pipe*	*Soakage Well*	*Soakage Bed*	*Containment On-site*
Unit	***Metres***	***Metres***	***m^2 contact area***	***m^2 contact area***	***Litres***
RESIDENTIAL DWELLING					
All Waste (125 l/p/d)					
min. 6 persons	38	42	75	75	3000
plus					
For each additional 2 persons	13	14	25	25	1000
Sewage Only (40 l/p/d)					
min. 6 persons	12	14	24	24	960
plus					
For each additional 2 persons	4	5	8	8	320

TABLE 9

Effluent disposal requirements using EPR of 15 litres/m^2/day, Roof catchment

	Plastic Tunnel	*Perforated Pipe*	*Soakage Well*	*Soakage Bed*	*Containment On-site*
Unit	***Metres***	***Metres***	***m^2 contact area***	***m^2 contact area***	***Litres***
RESIDENTIAL DWELLING					
All Waste (125 l/p/d)					
min. 6 persons	25	28	50	50	3000
plus					
For each additional 2 persons	9	10	17	17	1000
Sewage Only (40 l/p/d)					
min. 6 persons	8	9	16	16	960
plus					
For each additional 2 persons	3	4	6	6	320