
GUIDELINES FOR ENVIRONMENTAL MANAGEMENT

GUIDELINES FOR AERATED ON-SITE WASTEWATER TREATMENT SYSTEMS

Domestic Wastewater Management Series

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Publication 760
ISBN 0 7306 7613 7

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FOREWORD

EPA Victoria is continually looking for ways to ensure the environment is better protected for the benefit of current and future generations of Victorians, while improving service delivery to stakeholders. To meet both these objectives, EPA has prepared the Guidelines for Aerated On-site Wastewater Systems.

With more than 250,000 on-site wastewater systems in use in Victoria, efficient ways to regulate them and continually reduce their impacts are essential. The guidelines will allow the approval of aerated on-site wastewater systems to move from individual assessment of new systems to a more generic approach.

Aerated systems complying with the guidelines will be considered suitable for approval under S 53 M(7) of the *Environment Protection Act 1970* as systems that local government can allow to be installed. The guidelines include procedures for the assessment of novel systems and hence encourage manufacturers and designers to strive for continuous improvement in the environmental performance of their plants.

The guidelines are consistent with the New South Wales Aerated Wastewater Treatment Systems Accreditation Guideline. EPA would like to thank the New South Wales Health Department for its help with the development of the guidelines.

EPA believes that the guidelines will achieve the joint objectives of moving to a better level of environmental quality, while streamlining the approval process for aerated on-site wastewater systems.

EPA would be pleased to receive comments on the guidelines. Comments will, where appropriate, be incorporated in future editions.



BRIAN ROBINSON
CHAIRMAN

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INTRODUCTION

The guidelines outline design criteria, construction requirements and performance objectives that domestic and small commercial Aerated Wastewater Treatment Systems must achieve to gain approval under section 53 M (9) of the *Environment Protection Act 1970*. They are intended to provide guidance and certainty to manufacturers of these systems. Systems will have to demonstrate compliance with the guidelines in order to be approved by the Authority. The guidelines are performance based and focus on the required output criteria from an on-site aerated wastewater treatment system and hence allow for innovative approaches. The guidelines foster best practice, based on a quality management approach to achieving the environmental objectives. To encourage a National approach, the guidelines are consistent with the NSW Aerated Wastewater Treatment Systems Accreditation Guideline.

1.1 Background

Under section 53M(7) of the *Environment Protection Act 1970*, EPA assesses for generic approval on-site wastewater treatment systems designed to discharge 5000 litres or less of sewage a day. A municipal council (the council) can only issue permits for the installation of wastewater treatment systems that have been approved by EPA. The council upon application assesses the suitability of an EPA approved system for a specific site. If EPA has not approved the system, then the Council cannot permit it to be installed.

EPA issues certificates for approved systems, with conditions attached, to ensure the systems operate satisfactorily. For example, an Aerated Wastewater

Treatment System (AWTS) will require regular maintenance and testing to verify its ongoing performance and the EPA approval will include conditions to ensure this monitoring and testing takes place. The list of approved systems and their conditions of approval can be found on the EPA website (www.epa.vic.gov.au). (Wastewater treatment devices of a larger capacity are assessed individually under an EPA works approval application).

The guidelines contain the minimum performance criteria that must be met for an Aerated Wastewater Treatment System (AWTS) to be approved by EPA.

1.2 Abbreviations

The following abbreviations are used in the guidelines:

AS	Australian Standard (current edition)
AWTS	Aerated Wastewater Treatment System
BOD ₅	Biochemical Oxygen Demand 5 days
cfu	colony forming units
EPA	Environment Protection Authority Victoria
NATA	National Association of Testing Authorities
SS	Suspended Solids (includes NFR or Non Filterable Residue)
STP	Sewage Treatment Plant

AERATED ON-SITE WASTEWATER TREATMENT SYSTEMS

1.3 Definitions

AWTS	a human waste treatment device that treats blackwater and/or greywater using the treatment process of aeration to produce treated effluent	sewage	and land used in connection with the system. It applies to all wastewater treatment systems designed to discharge 5,000 litres or less of sewage a day
blackwater	human excrement or matter contaminated with human excrement discharged to a toilet, septic closet liquid and solid human body waste (toilet waste)	suspended solids	any waste containing human excrement or domestic wastewater solids retained after filtration either through a glass fibre filter paper followed by washing and drying at 105°C, or by centrifuging followed by washing and removal of the supernatant liquid
BOD ₅	the amount of dissolved oxygen consumed by microbiological action when a sample is incubated, usually for five days at 20°C (representing about 70 to 80 per cent of the total BOD in a sample)	total loading	maximum design capacity of the AWTS including the emergency capacity over the whole of the AWTS
greywater	includes wastewater from a handbasin, bath, shower, kitchen and laundry but excludes blackwater	wastewater	liquid waste and their solids component generated by a premise, and includes greywater and blackwater
loading	total hydraulic flow of wastewater applied to AWTS per day		
manufacturer	the person, company or firm, and any nominated representative of the company or firm submitting the AWTS for approval by EPA		
on-site system	a system for the bacterial, biological, chemical or physical treatment of sewage, and includes all tanks, beds, sewers, drains, pipes, fittings, appliances		

APPROVAL PROCEDURE

All applications must be made on the application form attached (see appendix 1) and also available from EPA’s website and EPA offices. An application will only be dealt with when all the information requested has been supplied. Systems are usually approved for a fixed period of up to five years. If the manufacturer wants the approval to be renewed, it should reapply for continued approval six months before the expiry date of the original approval.

AWTS for approval must be tested in accordance with the guidelines. Innovative designs may be submitted for approval and will be assessed in accordance with the criteria detailed in the guidelines. There are five possible outcomes from these tests as indicated in Table 1.

Table 1: Testing outcomes

TEST RESULT	OUTCOME
Complies	AWTS approved for a term of up to 5 years subject to conditions.
Failure (due to errors or mishaps in testing procedures or analysis)	Extend test period to include an additional test
Failure (due to component failure)	Retest commencing from initial commissioning
Failure due to external influences on testing procedure	Corrective actions shall be agreed to between the manufacturer, testing agency and regulatory authority. Testing resumed at appropriate point in test program
Failure to meet compliance criteria	Rejection – no approval

2.1 Application Criteria

When testing of the AWTS has been completed an application shall be submitted to EPA on the application form (see appendix 1). The application for approval shall contain:

1. An evaluation report completed by an independent testing agency detailing the testing methods used and including logsheets, comparing performance against the test criteria, and information on the security arrangements adopted to ensure testing integrity.
2. Documentation showing approval of the testing agency as a third party quality management certification body by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ) or by another accreditation body with which JAS-ANZ has a Memorandum of Understanding.
3. Evidence that the laboratories used for off-site chemical and bacteriological determinations are National Association of Testing Authorities (NATA) accredited for the specific tests.
4. A statement of the warranty and guaranteed service life of the AWTS and all components.
5. Product approval to the StandardsMark Quality Assurance Program or equivalent.
6. Details of the design criteria and design calculations.
7. A copy of the Maintenance and Site owner's manuals and service schedule specified in the application form.
8. A numbered copy of certified engineering drawings to scale on A4 paper, dimensioned and accompanied by a listing of all components with name, model, size, description, function, material of manufacture and location in the AWTS. All components are to be shown including the electric motor(s), gearbox, compressor, pump(s), valves, diffusers, venturi, media, media fixings, chlorinator, pipework, scum collection and sludge pumping equipment, baffles, partitions, brackets, fastenings, electrodes, float switches, control panel and the arrangement of the alarms.
9. An electronic diagram in pdf format of the system, which, if approved, will be attached to the approved certificate on the EPA website.

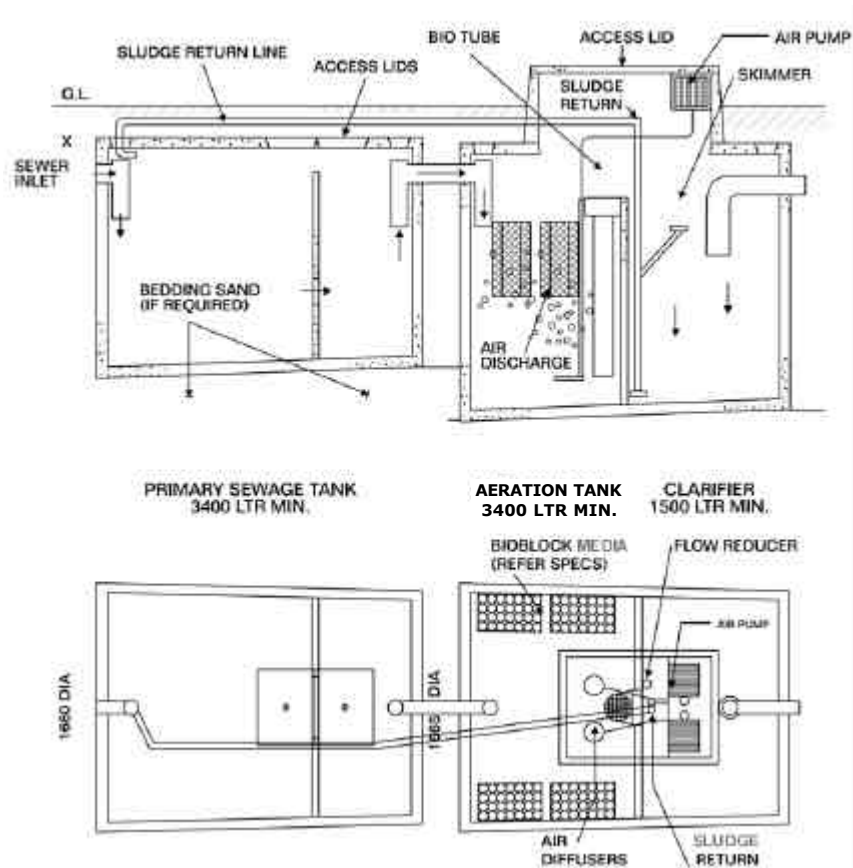
NOTE: A preliminary application may be submitted for comment and clarification prior to commencement of any tests and submission of a formal application

The manufacturer shall provide a copy of the following information to each local authority where it is intended to install AWTS in their area following EPA approval been obtained:

- Statement of Warranty
- Statement of Service Life
- Quality Assurance Certification
- Installation Manual
- Service Manual
- Household Operators Manual
- Service Report Form
- Engineering Drawings on A3 format

AERATED ON-SITE WASTEWATER TREATMENT SYSTEMS

- Detailed Specifications
- A4 Plans
- Approval documentation as obtained from EPA
- Full description of major mechanical and electrical component parts.



This diagram is an example of the required electronic format diagram of an aerated wastewater treatment system for placement on the EPA website list of approved systems

SYSTEM DESIGN

3.1 General

The design factors in this section are provided for guidance only. The guidelines allow for innovative designs (which may be known as conventional or unconventional) to be developed and tested in accordance with the Test Criteria presented in Appendices 2 and 3 and Table 5. All systems shall comply with the construction requirements of section 3.9 of this document.

The design of an AWTS shall ensure that the treated effluent complies with the requirements of the guidelines. A process design has been included in appendix 4 for information. Where a chemical disinfectant is used the AWTS shall be provided with separate contact and irrigation chambers.

EPA can give generic approval for systems with maximum daily hydraulic design capacity of 5,000 litres or less. Approval is usually based on the hydraulic and organic design-loading rate of the AWTS under test conditions. (In some other States the maximum capacity for generic approval is 10 persons). The minimum capacity shall be eight persons. An additional emergency capacity of 1,000 litres is to be made available above the normal operating depth of the system without cross contamination occurring between chambers.

The AWTS shall be designed and manufactured to ensure that:

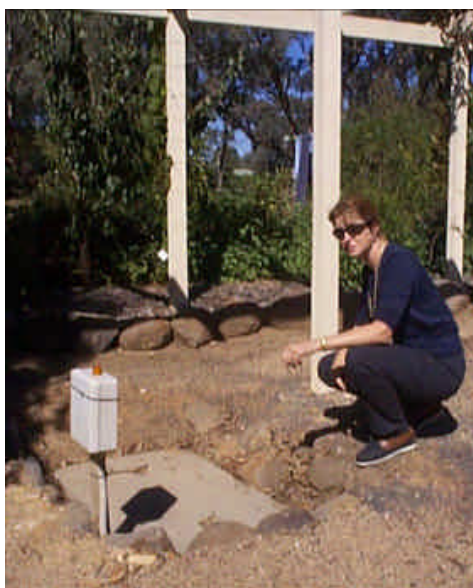
1. It is designed to only receive wastewater and no other waste.
2. The AWTS and component parts should preclude infiltration of groundwater or surface

water, and prevent escape of liquids through other than designated openings, when installed according to the manufacturer's instructions.

3. It should be designed and constructed such that the blockage of vents or leakage of liquids through other than standard discharge orifices does not occur.
4. The design allows the system to be operated without offensive odours occurring.
5. It should be manufactured to prevent entry of insects and vermin, when installed and operated according to the manufacturer's instructions.
6. The AWTS shall be free of hazards, which could cause injury to any persons installing, servicing or using it.



An established AWTS integrated with the landscape. The background flora thrives on the treated effluent that is reused via subsoil irrigation.



The above photo shows a system that has been incorrectly installed below ground level, thus allowing ingress of stormwater.

The system's capacity (volume) must be calculated and the application should include the following breakdown:

- loading;
- total loading;
- system's waste volume capacity (not overall size) m³; and
- loading as a percentage of system capacity.

The AWTS should be designed to perform continuously and without any intervention between quarterly inspections by the maintenance contractor.

Outlet filters have been shown to improve the quality of the effluent when maintained regularly.

The design of the AWTS should be based on the loads in Table 2 following.

Table 2: Minimum loading requirements

Parameter	Criteria
Minimum daily flow	150 litres per person*
Average daily BOD ₅	70g per person [#]
Average daily total suspended solids	70g per person
Average daily total nitrogen	15g per person
Average daily total phosphorus	2.5g per person

*Actual hydraulic design capacity to be in accordance with the *Code of Practice - Septic Tanks*

[#]Default value, other values may be considered, if full technical justification is provided.

The AWTS shall comply with the construction requirements of these guidelines and, where applicable, AS 1546.

3.2 Anaerobic chamber

An anaerobic chamber should be provided for the primary sedimentation and anaerobic processes. It may be a two compartment septic tank designed in accordance with AS 1546.1, based on retention of daily flows for 24 hours, plus an allowance for a sludge accumulation over three years, with the following minimum liquid capacities:

- 2,750 litres for eight persons;
- 2,900 litres for nine persons;
- 3,050 litres for 10 persons; and
- for larger sizes up to 5,000 litres, also refer to the EPA Publication *Code of Practice for Small Wastewater Treatment Plants*.

The AWTS shall incorporate a surge flow reduction device to prevent a flow to the aerobic chamber exceeding 10L/min, except when the water level in the anaerobic chamber exceeds 75mm above normal operating water level. This may necessitate an

increase in wall height between the anaerobic and aerobic chambers to prevent scum transfer.

3.3 Aerobic chamber

An aerobic chamber shall be provided for aerobic stabilisation of the wastewater after treatment in the anaerobic chamber.

Aeration shall be provided by diffused air, mechanical aeration, percolation through fixed media (biological trickling filter), or by rotating biological contactors.



This thriving garden bed reuses treated effluent from an onsite household water system. Note the surrounding dry landscape.

3.4 Media

The aerobic chamber may contain media (including a biological trickling filter) on which biological growth develops that shall comply with the following requirements:

- The minimum capacity in the aerobic chamber should be based on a detention time of 40 hours and not less than 250 litres per person. In the case of biological filters, the volume of the aerobic chamber shall be taken as the volume of

the media plus the volume of the recirculation chamber.

- The total surface area per unit volume of the media in the aerobic chamber should not be less than $80\text{m}^2/\text{m}^3$ and should be provided on the basis of:

Table 3: Media surface area

Type	Criteria
Rotating biological reactor	5 grams BOD_5 removed / m^2 surface area/day
Biological trickling filter	5 grams BOD_5 removed / m^2 surface area/day
Diffused aeration system	8 grams BOD_5 removed / m^2 surface area/day



An example of fixed media looking down into an AWTS.

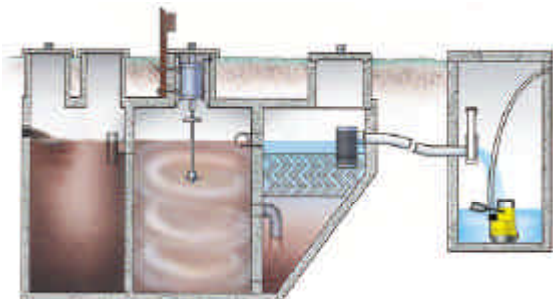
- The surface area of the walls and floor shall not be used in any calculation.
- Flow distribution or mixing in the aerobic chamber shall ensure the uniform flow of liquid over the entire wetted surface areas.
- The spacing between the adjacent media surfaces shall be sufficient to prevent clogging by

the biomass between desludging at maintenance intervals recommended by the manufacturer.

- The media shall be fixed or locked into position and be capable of being cleared of accumulated biomass. In the case of biological ball media, the media shall be prevented from transfer into other chambers in the event of overflow.



Stack of fixed media for use in an AWTS.



The secondary chamber above shows one method of diffused aeration.

3.5 Air supply

When **diffused aeration** is used in the aerobic chamber, the system shall conform with the following requirements:

- (a) The supply of air shall be calculated using the standard oxygen transfer rate of $3.0\text{kg O}_2/\text{kg BOD}_5$ removed.
- (b) The air supply for the air lift pumps, which is additional to the above requirement, shall be stated together with air supply for various pump rates and static lifts.
- (c) A minimum dissolved oxygen concentration of 2.0mg/L shall be achieved in the aerobic chamber, when not designed for denitrification.
- (d) The air supply to the aerobic chamber shall be introduced in such a way as to ensure complete mixing of the contents, without sludge accumulation.
- (e) The air supply device shall be fitted with a back-pressure reduction apparatus.
- (f) The air supply device shall be fitted to prevent overheating due to environmental conditions.

When **surface aeration** is used in the aerobic chamber, the system shall conform to the following requirements:

- (a) The supply of air shall be calculated using the standard oxygen transfer rate of $2.4\text{kg O}_2/\text{kg BOD}_5$ removed.
- (b) A minimum dissolved oxygen concentration of 2.0mg/L shall be achieved in the aerobic chamber when not designed for denitrification.

- (c) The contents of the aerobic chamber shall be circulated to ensure complete mixing of the contents to prevent accumulation of sludge.

When aeration is provided in the aerobic chamber by a two-phase mixing unit (venturi tube) connected to a recirculation system, the system shall comply with the following requirements:

- (a) The air supply through the venturi tube shall be calculated using the oxygen transfer rate of $3\text{ kg O}_2/\text{kg BOD}_5$ removed.
- (b) The capacity of the recirculation pump shall be designed to allow for additional loads, such as sludge return, where necessary.
- (c) A minimum dissolved oxygen concentration of 2.0 mg/L shall be achieved in the aerobic chamber when not designed for denitrification.

Systems will be deemed as not removing nutrients. If the system is designed for nutrient removal then additional testing procedures to verify performance are required.

3.6 Secondary sedimentation/clarifying chamber

A secondary sedimentation chamber should be provided to remove settleable solids and floatable scum passing from the aerobic chamber.

The secondary sedimentation chamber should have a minimum liquid surface area of 0.05 m^2 per person, a minimum depth of 900 mm and be designed for six hours detention of daily flow.

Provision shall be made for frequent automatic return of settled solids and floatable scum to the first compartment of the anaerobic chamber. Control valves shall be fitted to the suction pipes to facilitate

balancing of the system and provision shall be made for dismantling the pipes to remove blockages. Settled solids shall not exceed 10 per cent of the volume of the secondary sedimentation chamber.

A sludge hopper with sloping sides of a minimum of 55 degrees to the horizontal should be provided. The settled solids removal system shall be capable of removing the settled solids from the entire floor area of the sludge hopper.

The inlet and outlet shall be designed to minimise turbulence and carryover of solids with the effluent.



An example of a biological rotating disc system.

3.7 Disinfection and disinfection chamber

Where a chemical disinfectant is used the AWTS shall be provided with separate contact and irrigation chambers. A separate disinfection chamber is required to prevent short-circuiting. The minimum capacity of the disinfection chamber should be 300 litres.

Disinfection is not required if the effluent is to be discharged below ground.

Where a chlorine disinfection technique is used, the disinfection apparatus shall be designed to reliably provide a range of free residual chlorine concentrations in the effluent from the disinfection contact chamber. Concentrations shall range from 0.2mg/L to 2.0mg/L at the maximum 30-minute flow rate of 10L/min as defined in appendix 3.

Where a solid chlorine disinfecting agent is used it shall be contained within a water soluble material which does not stick to the disinfecting apparatus, swell or clog the disinfecting apparatus. It shall provide a constant chlorine concentration to the effluent over the whole range of flow rates.

The disinfection apparatus shall have a capacity to store at least four months supply of disinfecting agent without replenishment.

The disinfection apparatus shall be capable of adjustment to alter the disinfection rate.

Backflow from the disinfecting apparatus to the secondary sedimentation/clarifying chamber shall be prevented.

Where an electronically controlled disinfection device is installed, it shall be linked to an alarm system to warn of failure.

3.8 Irrigation chamber

A separate effluent storage chamber shall be provided to cope with the expected flows.

The irrigation pump shall have performance characteristics that match the hydraulic characteristics of the irrigation system.

The irrigation system shall be of sufficient capacity to ensure that the rate of discharge is at least 15 L/minute.

3.9 Construction requirements

General

The AWTS shall be marked with the brand name, model and month and year of manufacture which should be clearly visible after installation.



An example of thriving vines, with background four-year-old cypress trees, grown from household AWTS-treated effluent in an otherwise dry area.



A photo of the required Australian Standards Markings for an AWTS.

The septic tank (anaerobic chamber) incorporated in the system shall meet the requirements of AS 1546. All household systems shall only use AS 1546 approved septic tanks.

The AWTS shall be capable of venting through the educt vent pipe on the house drainage system and allow ventilation of the AWTS.

All metal components shall be of stainless steel or other non-corroding material unless adequately protected against corrosion to satisfy the service life of the component.

All plastics and perishable components in the AWTS subject to exposure to ultraviolet radiation, or an adverse chemical or biological environment shall be able to retain their integrity under normal operating conditions to satisfy the service life of the component.

Where plastic pipes and pipefittings are used they shall be UPVC complying with AS 1260 or AS 1415.

All components shall be securely fixed to withstand all loads encountered during transportation, installation and normal operation.

Unless specifically designed to operate in a submerged condition, all mechanical and electrical equipment, when located within the AWTS vessel, shall be located above the maximum water level of the AWTS. The maximum water level shall be taken as the normal operating level plus a one day nominal design flow.



Concrete AWTS under construction



3.10 Structural Soundness

The design of the tanks shall meet the requirements of AS 1546 with regard to:

1. Internal and external pressures including hydrostatic and geotechnical pressures when either full or empty;
2. Mass of tank and contents;
3. Localised loads acting on the supports, lugs and/or other attachments and on internal baffles and ducting;
4. Normal loads applied during transport and installation;
5. Fatigue;
6. Soil conditions;
7. Corrosive environments; and
8. Ground anchorage.

3.11 Access

The AWTS shall allow ready access to the chambers without any requirement for major dismantling of component parts, to enable:

- Retrieval of foreign objects or matter which may enter the AWTS;
- Convenient periodic inspection, as may be required by the design;
- Accessibility for repairs to the inside;
- Easy access to components that may malfunction, wear or require cleaning, for inspection, cleaning, repair, or replacement; and
- Access to pumps, fans and any other elements (included in the installation), to facilitate

replacement without coming into direct contact with untreated effluent.



An example of an easy lockable access ground level lid to AWTS.

3.12 Mechanical Equipment

All mechanical equipment shall be suitable for continuous and intermittent operation.

Bearings shall be of a type able to provide long life, minimal maintenance and corrosion protection from the aggressive environment.

Component parts subject to malfunction, wear, or requiring cleaning shall be easily accessible for inspection, cleaning, repair or replacement. EPA approval of an AWTS includes its associated equipment such as blowers, pumps (including the irrigation pump), float switches and alarms.

Systems approved for commercial application should have a standby aeration device and pumps.



A view of an AWTS after installation showing some internal components.



An AWTS showing some of the internal components on display outside the tank before installation.

3.13 Electrical equipment

All electrical equipment shall be suitable for continuous and intermittent operation.

Electric motors shall comply with AS 1359 and AS 1360 and be fitted with thermal overload devices. Where there is any possibility of an explosive gas mixture developing near a motor, the motor shall be intrinsically safe.

The AWTS shall be provided with an alarm system to indicate an electrical, blower or pump failure. The alarm system shall comprise audible and visible alarms with a muting facility for the audible alarm. The muting facility shall reset to audible after 24 hours. The visual alarms shall be visible from inside the dwelling. If disinfection is electronically controlled, the warning of device failure shall be linked to the alarm system.

All the electrical components and installation for and incidental to the AWTS, shall accord with AS3000, *Electrical Installation - Buildings Structures and Premises*.

3.14 Noise

The maximum permissible noise level with all equipment operating (excluding audible alarm) shall be 40dB(A) at a range of 1m.

TEST CRITERIA

Compliance testing shall be undertaken for all designs, according to this section. Additional testing may be required when modifications are made to designs that have previously been approved under the guidelines.

Nitrogen and phosphorus testing will be required for plants claiming or approved for nutrient reduction.

The criteria include:

- effluent quality requirements;
- warranty and service life;
- quality control; and
- manuals.

4.1 Effluent quality

The test AWTS (including the alarm system) shall be installed adjacent to a sewage treatment plant operated by a public utility or corporation that treats wastewater similar to that which the system is intended to treat. Screened raw influent shall be diverted from the sewage treatment plant to the inlet of the AWTS and the flow rate shall be capable of being measured and automatically logged.

Alternatively, the raw influent may be obtained from a sewer pumping station, or sewerage main, and the test AWTS sited to receive such raw influent. The quality of the effluent for commercial systems must reflect that which the system is intended to treat.

The raw influent should not be pre-treated by chemical addition. For systems being assessed for the domestic market, the influent should have the characteristics shown in Table 4 below.

Table 4: Influent characteristics

COMPONENT	CHARACTERISTIC
BOD ₅	150 – 300mg/L
SS	150 – 300mg/L
Total Nitrogen	20 – 100mg/L
Total Phosphorus	6 – 25mg/L

The AWTS shall be commissioned in accordance with the manufacturer's recommended procedure and then in accordance with the following procedure in conjunction with appendices 2 and 3 of this guideline.

The commissioning day shall be the commencement of week one as stated in appendix 2.

On commissioning the AWTS will receive sewage:

Commercial

- At the maximum design rate for commercial systems (as determined at the time of application).
Any system designed for more than 10 persons is included as a commercial system.

Domestic

- At the rate of 190L/hour for 10 persons, 170L/hour for nine persons and 150L/hour for eight persons, for eight hours per day being:
 - ~ between 6am and 11am representing the morning peak flow of five hours,
 - ~ between 6pm and 9pm representing the evening peak flow of three hours.

During weeks eight and 16, test periods occur over five days using the protocol of appendix 3. Once a test period is complete, flows are returned to those stated above.

During weeks 12 and 24 a maintenance service is performed. In week 17 the AWTS is to be shut down, 800L of liquid removed from the anaerobic chamber and 800L of domestic septic tank sludge added to the first anaerobic chamber of a household system. For a commercial system the amount of sludge is to be calculated according to the design organic loading rate. The anaerobic chamber of the AWTS is allowed to settle for 24 hours and then flows returned to those stated above.

During week 26 (test period three), monitoring occurs over five days using the protocol outlined in appendix 3. The test is then concluded and the plant decommissioned.

The test period shall be delayed where the STP has been subjected to wet weather flows.

All compliance checking, monitoring, testing and sampling is to be performed or supervised by an agency accredited as a third party quality management certification body, certified by JAS-ANZ, or by another accreditation body with which JAS-ANZ has a Memorandum of Understanding, and at the cost of the applicant.

The final effluent samples for *E. coli*, disinfectant concentrations, BOD₅, and SS shall be taken from the outlet of the disinfection chamber, if provided, or other locations approved by EPA.

The samples for BOD₅, SS and *E. coli* taken by the testing agency shall be directly transported and delivered to a laboratory, accredited by NATA to carry out analysis for the parameters specified. Analyses for disinfectant concentration shall be tested on-site immediately after sampling.

4.2 Testing requirements

The AWTS shall be installed in accordance with the manufacturer's instructions and specifications and in accordance with any requirements specified by the local municipal council. If an existing unit is submitted for testing, the unit must be certified as having been constructed and installed in accordance with the manufacturer's instructions.

During testing, the AWTS shall be operated and maintained in accordance with the manufacturer's instructions.

All compliance checking, monitoring, sampling and analysis is to be performed or supervised by a third party quality management system certification body accredited by JAS-ANZ and at the cost of the applicant. Sampling and analysis must be performed by a laboratory accredited by NATA for those purposes.

Access to the AWTS by the manufacturer or their authorised representative shall be controlled by the testing agency. Testing agency personnel shall make unannounced visits to the test site at periodic intervals during the testing period.

An existing installation selected for testing shall be restored to a condition representative of a new installation prior to commissioning.

Operation during the test period should be in accordance to the manufacturer's instructions and will be carried out by the occupier of the premises.

An operating manual and checklist is to be provided for the use of the occupier of the premises.

A record of usage is to be kept for a minimum period of a month, and shall be considered representative of use during the testing period.

4.3 Performance conditions

The following performance conditions shall apply.

- Rated capacity: An AWTS shall be approved for the usage rate used during the total testing period.
- The performance test criteria for AWTS are presented in appendices 2 and 3.

4.4 Test report

The testing agency shall prepare an evaluation report based on the design criteria, construction requirements, test criteria and testing experiences.

The report shall include the following information:

- Identification of the type and model tested, compliance with drawings, BOD₅ and hydraulic rated capacity, and loadings and testing methods.
- Schematic or design diagram to indicate integral components of the AWTS tested.
- Description of the test site.
- Log of actual use during testing, including stress loading, with documentation of all supplemental loading (quantity and type) supplied during the test.
- A log of tests, compliance calculations, maintenance, equipment or component failures and any other factors pertinent to the test evaluation.
- Results of sampling schedule and performance criteria.
- Chronological list of any scheduled or unscheduled maintenance performed during the test.

- Chronological list of pertinent equipment/component failures and actions required for correction
- Incidents relating to the testing agency equipment or personnel performance affecting test conditions, or data acquired during testing
- Quantity and quality of wastewater discharged from the AWTS or any of its components during the test.

4.5 Test criteria

Compliance testing shall be undertaken in accordance with this section.

The compliance criteria for approval shall be as follows:

Table 5: Compliance criteria

Parameter	Criteria
BOD ₅	90% of the samples shall have less than or equal to 20mg/L with no sample greater than 30mg/L
Total suspended solids	90% of the samples shall have less than or equal to 30mg/L with no sample greater than 45mg/L.
E. coli count (determined by either the most probable number or membrane filter technique)*	90% of the samples taken on each day shall have not exceed 10-cfu/100mL, with no sample exceeding 200-cfu/100mL.
Free residual chlorine*	Concentrations shall be in the range of 0.2mg/L to 2.0mg/L in all samples taken where this process is used

* Refer to section 3.7.

The testing agency shall prepare an evaluation report based on the design criteria, construction requirements, and test criteria with particular reference to:

- Identification of the type and model tested, compliance with drawings, rated capacity, loadings and testing methods; and
- A log of tests, compliance calculations, maintenance, equipment or component failures, and other factors pertinent to the test evaluation.

4.6 Warranty and guaranteed service life

All metal fittings, fasteners and components of the AWTS other than the pumps and motors shall be of non-corroding material and shall have a service life of at least 15 years. Service life means being designed to reliably comply with the test criteria for the period stated.

All mechanical and electrical parts shall have a minimum service life of five years and a minimum warranty period of 12 months.

Other AWTS components shall have a minimum warranty period of three years, during which all labour and materials shall be supplied free of cost by the manufacturer.

The AWTS shall have a minimum warranty period of three years during which all labour and materials shall be supplied free of cost by the manufacturer other than those referred to in the above paragraphs.

4.7 Quality control

The manufacturer shall obtain Product Approval to the StandardsMark Quality Assurance Program or equivalent, or be accredited to ISO 9000. Where the applicant has not yet commenced any manufacturing process, and Quality Assurance is not possible, the manufacturer shall submit documentary evidence of application for assessment under a quality assurance scheme.

This shall be obtained within 12 months of the date of the certificate of approval or re-approval of the system.

A full description of major mechanical and electrical component parts must also be listed.



Photo of one type of AWTS concrete tank.

Quality control of all components is required by AS1546.

4.8 Manuals

The following manuals and document schedule shall be produced and submitted.

A **comprehensive installation manual** shall be produced and submitted with:

- A full description of major mechanical and electrical parts;
- Instructions to consider location of the AWTS in a well-vented area;
- An arrangement using diagrams of pipework, ducting and electrical components to AS 3000 (if applicable);
- Users' instructions for operation and maintenance;
- An overview of the AWTS and its intended use (for example, continuous, intermittent (holiday), number of people served);
- Description of treatment process;
- Details of start up procedures;
- Details of routine maintenance procedures;

- Public health considerations;
- List of parts with each part numbered and identified on an illustration, photograph or print;
- User responsibilities; and
- Warranty and service life of parts and of the whole unit.

A **comprehensive service manual**, for use by an accredited service contractor, incorporating:

- A detailed three-yearly evaluation of the complete system; and
- A maintenance schedule based on three-monthly service intervals and three-yearly desludging.

A **maintenance schedule** specifying the work to be carried out by an accredited service contractor as part of the continuous maintenance and including:

- A service report sheet suitable for use by service technicians.

A **user instruction manual** suitable for use by the site (that is, home or owner) operator and including (but not necessarily limited to):

- An overview of the AWTS and intended use;
- Warranty and service life;
- Ongoing servicing and testing requirements;
- Trouble shooting and signs of failures;
- A list of toxic substances/loads to be avoided;
- Desludging requirements;
- Safety information;
- Spreading of hydraulic loads; and
- Alarm information and restrictions on use.

RENEWAL OF APPROVAL

Approval may be granted subject to conditions and normally shall be for a period of five years, unless withdrawn earlier by EPA.

EPA will work with local government to assess the performance of approved systems (householders using AWTS must monitor effluent quality annually and forward the results to the local council). Local councils should collate these monitoring results, while EPA intends to consolidate these results at statewide level, to assess how well approved systems are performing. EPA may withdraw approval from systems within the normal five-year approval period, if monitoring results fail to meet the criteria in the guidelines.

Systems approved for use in Victoria must be independently audited to verify their suitability for ongoing usage before the approval is renewed. The audit, which should commence at least 12 months prior to the expiry of the approval period, should be carried out in accordance with the following protocol.

5.1 Sampling protocol

The results of the testing program will be used to determine whether the approval will be renewed at the end of the initial approval period.

The manufacturer shall carry out a sampling program (in accordance with the following requirements) and forward the results to EPA **at least six months prior to the expiry of the approval period:**

1. Selecting AWTS: Select a minimum of five and a maximum of 10 per cent of the first 100 AWTS models installed and an additional 1 per cent per 100 installed thereafter for each

year of manufacture, which have not been serviced within two months prior to sampling. The maximum number of systems per manufacturer will under normal circumstances be limited to 20.

2. AWTS shall be selected at random by EPA from a complete list of installations in yearly order in Victoria.
3. BOD₅, SS, *E. coli* and disinfectant concentration (if applicable) are to be determined, together with a service history.
4. Sampling is to be performed by an independent JAS-ANZ accredited agent, and all analysis is to be determined by a NATA accredited laboratory for the specific tests, at the cost of the manufacturer.

Nitrogen and phosphorus testing will be required for plants claiming or approved for nutrient reduction.

Any modifications or variations of the approved design shall be submitted for separate assessment and variation of approval by EPA.

Effluent from an AWTS taken in any random grab sample should comply with the standards shown in Table 6.

Table 6: Effluent standards

Parameter	Criteria*
For all discharges	
BOD ₅	<20mg/L
SS	<30mg/L
Total chlorine	> 0.2 and < 2.0mg/L
For surface irrigation	
<i>E.coli</i>	< 10 orgs/100mL
For discharge to water	
<i>E.coli</i>	< 200 orgs/100ml

*EPA will consider the overall results of the audit to ensure that 90 per cent of all the samples achieve the above criteria

5.2 Test site criteria

The local authority's concurrence for the test site must be gained. The local authority may apply site conditions as considered necessary.

Manufacturers should arrange for access rights to properties where sampling is to be undertaken.

5.3 Testing requirements

All sampling of wastewater is to be conducted by a laboratory accredited by NATA or similar for the samples analysed.

5.4 Wastewater sampling

Wastewater sampling should be undertaken as follows:

- Disposable gloves shall be worn while collecting the sample;

- All samples shall be taken directly from the final discharge chamber;
- All samples for bacterial testing are to be placed in sterile containers;
- All samples to be labelled;
- A single set of samples from each nominated system to be analysed is to be taken at each testing event; and
- All sampling should be done in accordance with the EPA publication *A Guide to the Sampling and Analysis of Waters, Wastewaters, Soils and Wastes* (EPA Publication 441).

5.5 Submitting the application for renewal to EPA

The results of the testing program should be submitted to EPA at least six months prior to the expiry of the current approval. The report should indicate whether the results comply with the criteria in Table 6, the service history of the treatment plant, the average population served by the treatment plant during the five days preceding the testing and any factors that may have affected the unit's performance.

EPA encourages manufacturers to contact EPA and discuss any difficulties arising from the testing program before lodging a formal renewal application.

RELATED EPA PUBLICATIONS

- *Code of Practice – Septic Tanks* (EPA Publication 451) or any updated version.
- Information Bulletin
Development Approvals in Sewered and Unsewered Areas (EPA Publication 629)
February 2001.
- Information Bulletin
Land Capability Assessment for On-site Domestic Wastewater Management (EPA Publication 746).
- *Code of Practice for Small Wastewater Treatment Plants* (EPA Publication 500) June 1997.
- *A Guide to the Sampling and Analysis of Waters, Wastewaters, Soils and Wastes*, (EPA Publication 441) 7th edition March 2000.
- *Guideline for Wastewater Reuse* (EPA Publication 464) March 1996.

AERATED ON-SITE WASTEWATER TREATMENT SYSTEMS

APPENDIX 1: APPLICATION FOR APPROVAL OF ON-SITE WASTEWATER TREATMENT SYSTEM

[A SEPTIC TANK SYSTEM] STATE GOVERNMENT OF VICTORIA ENVIRONMENT PROTECTION ACT 1970

Please read EPA publication no. 629 and ensure all details are completed

APPLICANTS DETAILS:

Full Name of Company or Individual if not a Company:	Australian Company Number: (Certificate of Incorporation to be attached)
Registered Business Name:	Has this system been approved elsewhere? (Details of Approval Conditions to be attached)
Postal and email address for Correspondence:	
Address of registered or principal office in Victoria:	Treatment type, ie Aerated, Sand filter Waterless composting All waste Composting Reed bed, Displacement Electrolysis, Other (please state)
Expertise/experience in on-site wastewater treatment (<i>attach supporting evidence if insufficient space</i>):	
Particulars of Person(s) authorised on behalf of applicant to apply for approval: Name: Position:	Contact details: Phone:(BH) Mobile: Home: Fax: Email:
Name & model no. of septic tank system for approval:	
CERTIFICATION BY APPLICANT: I certify that the information contained in this application for approval is accurate. Name: Company position:	Signature Date:

APPLICATIONS TO BE SENT TO: THE MANAGER
OPERATIONS PROGRAM
EPA VICTORIA
GPO BOX 4395 QQ
MELBOURNE VIC 3001

AERATED ON-SITE WASTEWATER TREATMENT SYSTEMS

APPLICATION REQUIREMENTS:

Important: please attach full details for items below

1. Description of the proposed treatment technology including calculations used to size unit (<i>one page summary must be provided</i>).
2. Risk assessment of process and contingency measures for malfunctions.
3. Evaluation report to be audited by an accredited agency, detailing the performance of the system against the test criteria as set out Australian Standard 1547 – Disposal systems for effluent from domestic premises.
4. Documentation showing accreditation of the testing agency by Joint Accreditation System of Australia and New Zealand (JAS-ANZ) or equivalent.
5. Supply appropriate laboratory analysis reports which must bear National Association of Testing (NATA) endorsement.
6. Summary of septic tank system environmental performance.
7. A4 schematic drawing(s) of treatment plant labelled with manufacturers name, plant model no. and drawing no. in pdf format and hardcopy (to be included on the public domain certificate of approval).
8. Scaled A4 engineering drawing(s) of the system showing all components and dimensions of components, including (where relevant) motors, gearbox, compressor, pumps, valves, diffusers, venturi, media, media fittings, disinfection unit, pipework, scum and sludge collection, baffles, partitions, electrodes, float switches, control panel and alarms. The listing of components is to include the name, model, size, description, function, material of manufacturer and location in the treatment plant.
9. A copy of an A4 installation plan of the treatment plant suitable for use with an application to the local municipal council for a septic tank permit. <i>This must include a flow diagram of the treatment system.</i>
10. Product certification to the StandardsMark Quality Assurance Program or equivalent, ie ISO9000.
11. Copies of installation manual, servicing manual, homeowners operating manual and the recommended service report sheet.
12. A copy of the equivalent of the above information for systems tested outside Australia.
13. A statement of the Warranty and Service life.

All testing procedures to be performed according to EPA Guidelines

EPA internet site

www.epa.vic.gov.au

(under *For Local Government*)

EPA Information Centre

The Herald and Weekly Times Tower

40 City Road Southbank Victoria

Tel: (03) 9695 2722

Fax: (03) 9628 5391

EPA Regional Offices

Gippsland

7 Church Street, Traralgon 3844

Tel: (03) 5176 1744 Fax: (03) 5174 7851

North-East

24 Ely Street, Wangaratta 3677

Tel: (03) 5721 7277 Fax: (03) 5721 2121

North-West

43 Williamson Street, Bendigo 3550

Tel: (03) 5442 4393 Fax: (03) 5443 6555

South Metro

45 Princes Highway, Dandenong 3175

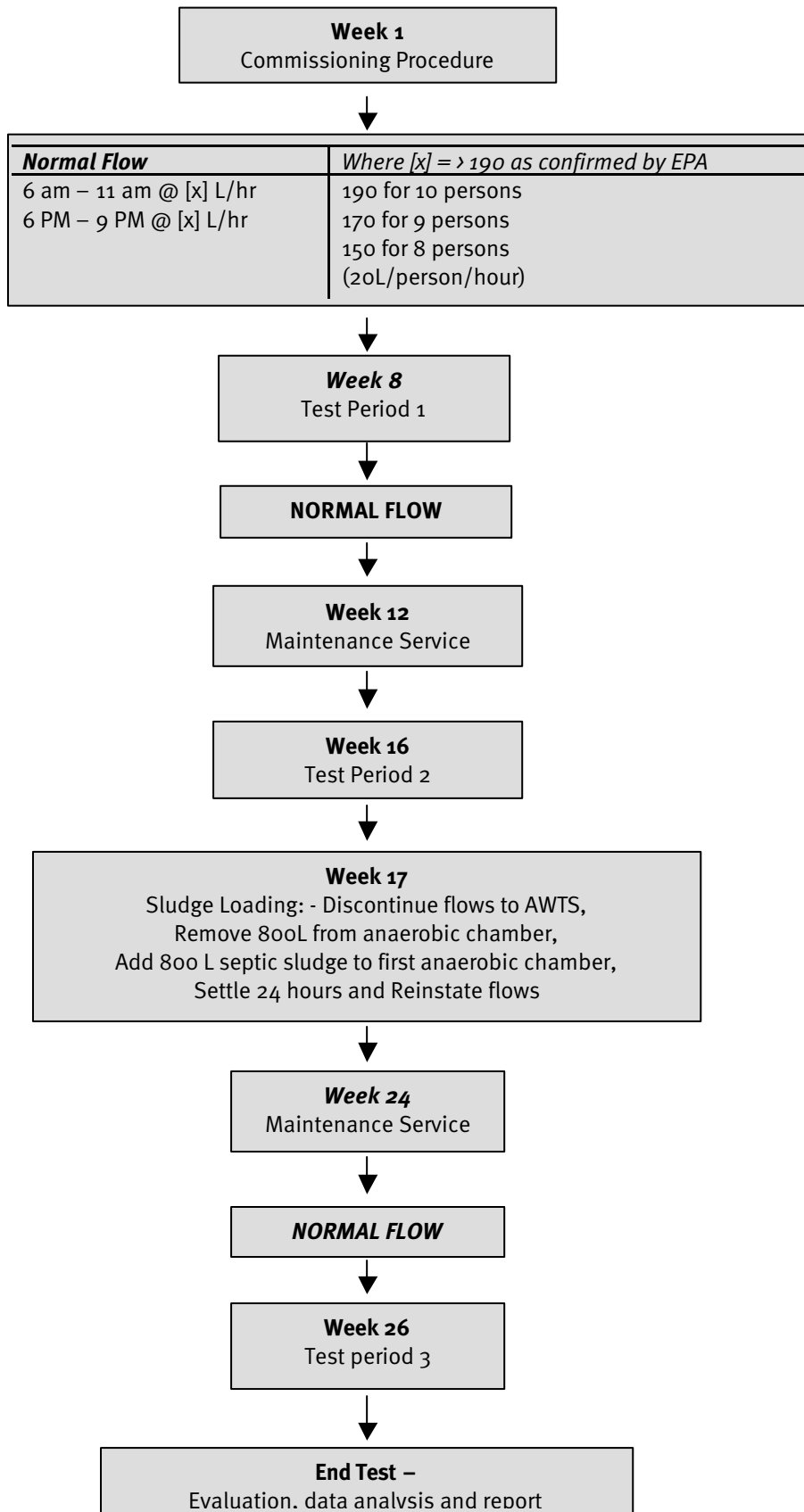
Tel: (03) 9794 0677 Fax: (03) 9794 5188

South-West

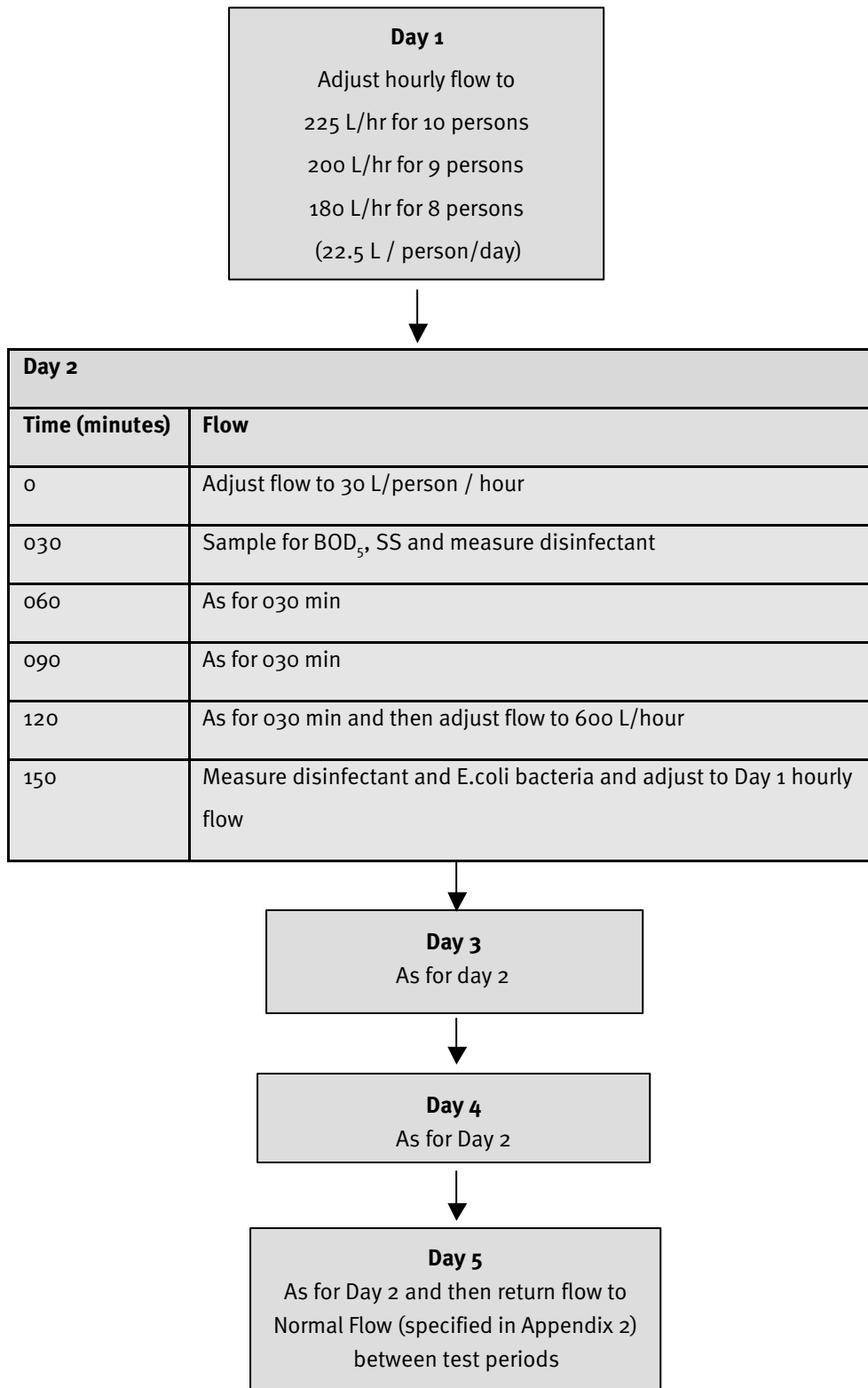
Cnr Lt Malop & Fenwick Streets, Geelong 3220

Tel: (03) 5226 4825 Fax: (03) 5226 4632

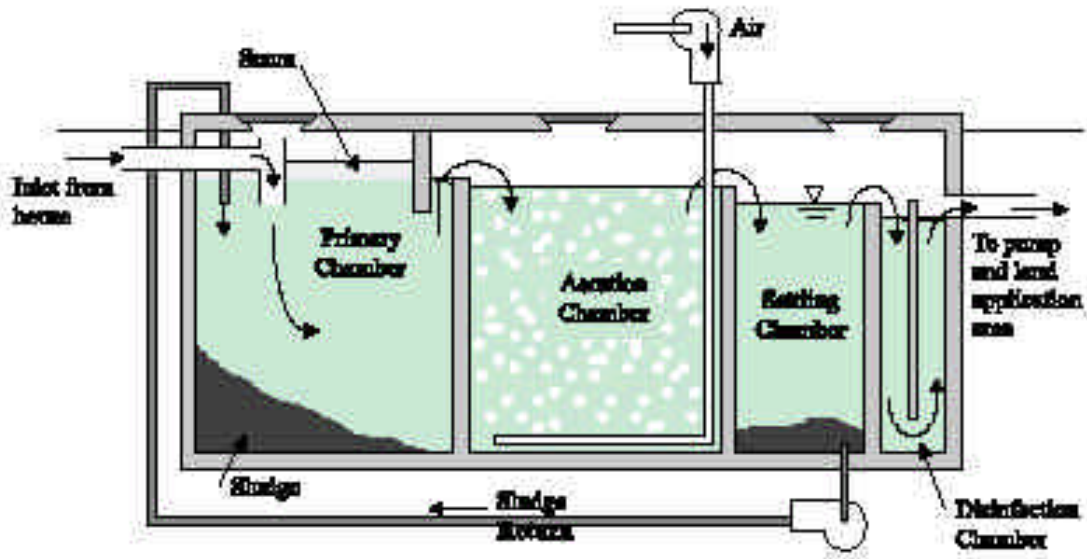
APPENDIX 2: AWTS TEST CRITERIA – FLOW CHART



APPENDIX 3: AWTS TEST CRITERIA – TEST PERIOD PROCEDURE



APPENDIX 4: AWTS DESIGN DIAGRAM



Cross-section of a suspended growth AWTS

Note

An AWTS system may incorporate the following processes:

- primary sedimentation,
- anaerobic biological treatment
- aerobic biological treatment
- secondary sedimentation / clarification
- outlet filter
- disinfection treatment,
- final effluent holding for irrigation.

APPENDIX 5 EXIT FILTERS

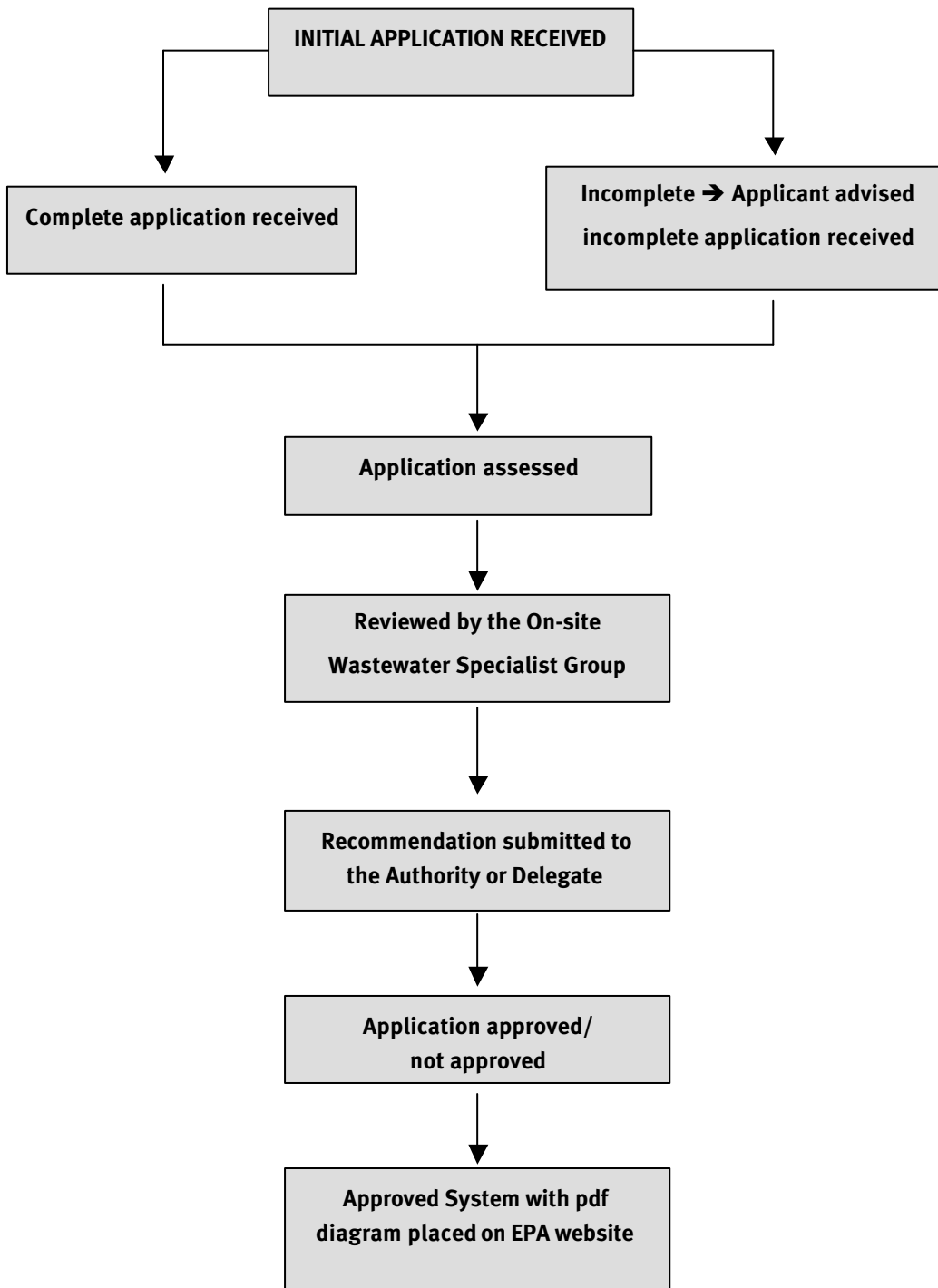


Studies have shown that a more complete biological process occurs when exit filters have been included in the treatment process. Exit filters are commonly fitted to the clarifier in an AWTS or the primary tank outlet in a traditional septic system.

Pictured here are two examples of an exit filter for use with an AWTS. The upper filter is designed for commercial use. The internal raised layered section lowers into the cylinder for use. The lower photograph shows an example of a filter designed for domestic use. There are a number of variations of the design of filters in use.



APPENDIX 6: EPA APPROVAL PROCESS



**APPENDIX 7: EXAMPLE OF A CERTIFICATE OF APPROVAL FOR AN ON-SITE
WASTEWATER TREATMENT SYSTEM**

APPROVAL PURSUANT TO

SECTION 53M(7) OF THE

ENVIRONMENT PROTECTION ACT 1970

An approval is hereby issued by the Environment Protection Authority (“the Authority”) under Section 53M(7) of the Environment Protection Act 1970 (“the Act”)

FOR:..... AERATED WASTEWATER TREATMENT PLANT.

This is to certify that the [Model Name] AERATED WASTEWATER TREATMENT PLANT (“the system”) is a type of septic tank system approved by the Authority for the purposes of Part IXB of the Act, subject to the attached conditions.

Approval Number: CA / XXXX

Date of Issue:

.....

SECRETARY

APPENDIX 8: TYPICAL AERATED WASTEWATER TREATMENT SYSTEM APPROVAL CONDITIONS

EPA Certificate of Approval

CA xx/xx

Definitions

Code of Practice means the most recent edition of EPA's *Code of Practice – Septic Tanks*

EPA means the Environment Protection Authority

Council means the local municipal council

Act means the *Environment Protection Act 1970*

Permit means a permit issued by a municipal council pursuant to Section 53 M 5 (b) of the Act

Approval Conditions

General

1. The system must be supplied, constructed and installed in accordance with the design and specifications shown in Figure No. xxxx of the application submitted to EPA on [date].
2. No modifications or variations to the system may be made unless approved by EPA.
3. This approval is valid for (5)/(x) years from the date of this approval or unless withdrawn earlier by the Authority.
4. The system is approved for domestic (and/or commercial) wastewater flow not exceeding [x] litres/day with an organic loading not exceeding [x] grams BOD₅/day.
5. The installation and operation of the system must comply with the relevant provisions of the Code of Practice.
6. A copy of the 'Owners Manual' as contained in the application must be supplied with every installation to the owner or occupier of the premises where the unit is installed.
7. A permanent, clear and indelible notice must be attached to the system in a prominent position that must include the manufacturers name and model number of the system.
8. Desludging of the system at least once every three (3) years must be a condition of the permit issued by council.
9. The length of subsurface absorption trenches used to dispose of effluent from the system to land must not be less than 50 per cent of that required for septic tank effluent, sized in accordance with Code of Practice.

AERATED ON-SITE WASTEWATER TREATMENT SYSTEMS

10. An alarm system with suitable visual and/or audio with mute facility must be installed in an appropriate location to indicate a failure of any effluent pump or aeration component.
11. The system must be installed by an accredited person with all inspection and access openings over all chambers being brought up to ground-surface level.
12. Electrical connections must be in accordance with requirements of the appropriate Electricity Supply Authority.
13. These systems can only be used in an unsewered area. Once sewer is available to the premises this system must cease to operate and all wastewater is to be connected to sewer, unless the treated effluent can be beneficially reused.
14. A copy of the following information shall be provided by the manufacturer to each local authority where it is intended to install an AWTS in their area:
 - Statement of warranty
 - Statement of service life
 - Quality Assurance Certification
 - Installation manual
 - Service manual
 - User's instruction, that is, householder's or site owner's manual
 - Service report form
 - Engineering drawings on A3 format
 - Detailed specifications
 - A4 plans
 - Approval documentation as obtained from EPA

A full description of major mechanical and electrical component parts

Waste Discharges

15. For new developments, off-site disposal to water may only be approved where the Council is satisfied that the applicant has demonstrated that:
 - the subdivision of the land occurred prior to 15 March 1988;
 - the effluent cannot be retained on-site;
 - the discharge will be consistent the State environment protection policy (Waters of Victoria); and
 - the discharge will comply with the requirements set out in EPA Information Bulletin 629.

AERATED ON-SITE WASTEWATER TREATMENT SYSTEMS

16. Where the council intends to issue a permit for a new off-site discharge of effluent to water, the Council must notify EPA in writing 14 days prior to decision of its intention to issue such a permit, enclosing a copy of the application and council's reasons for proposing to allow an off-site discharge.

17. The effluent from the treatment system must not exceed the following limits;

For all discharges:

Biochemical Oxygen Demand 20mg/L

Suspended Solids 30mg/L

For surface irrigation

E.coli 10 orgs/100ml

Free Residual Chlorine 0.5mg/L (min.) and 2.0mg/L (max.)*

For discharge to water

E.coli 200 orgs/100ml

Total residual Chlorine 1mg/L*

* For plants using a chlorination disinfection process.

18. The effluent may be disposed either from the premises to a legal point of discharge or to land to the satisfaction of the council. Where the disposal is via surface irrigation, the requirements of Certificate of Approval No.CA 035/93 (or any updated version) must be complied with.

Monitoring

19. The sampling and analysis program must be undertaken in accordance with the current edition of EPA's *A Guide to Sampling and Analysis of Waters, Wastewaters, Soils and Wastes* Publication 441, or other methods approved by the Authority.

20. If the effluent is **discharged from the premises** the permit must require the owner to cause a sample of the effluent to be taken and analysed by a person or laboratory registered by the National Association of Testing Authorities for the indicators biochemical oxygen demand (BOD), suspended solids (SS), *E. coli* and chlorine residual* testing, on a **quarterly basis**. For chlorine alternative disinfection processes, a verification test will need to be approved.

21. If effluent from the system is **disposed of to land** via subsurface absorption/transpiration trenches, the permit must require the owner to cause an annual sample of the effluent to be taken and analysed by a person or laboratory registered by the National Association of Testing Authorities. The sample must be tested for the indicators biochemical oxygen demand (BOD), and suspended solids (SS) on an **annual basis**.

Maintenance

22. Maintenance of the systems by an accredited person must be carried out at least once every three (3) months in accordance with the manufacturer's specifications.

- 23.** Copies of the maintenance and analysis reports must be submitted to the council at a time specified in the permit.

Reporting Results

- 24.** A report shall be submitted by the owner of the premises where the system is installed annually to council containing the following information:
- results of the performance evaluations referred to in Conditions 20 and 21;
 - copies of all laboratory analytical test reports;
 - copies of inspection and maintenance reports for the period.

REFERENCES

AS 2031.2 1987, *Selection of Containers and Preservation of Water Samples for Chemical and Microbiological Analysis, Part 2: Microbiological.*

AS 1319, *Safety Signs for the Occupational Environment.*

NSW Health Department 1998, *Aerated Wastewater Treatment Systems (AWTS) Accreditation Guideline*, September 1998.

AS/NZS 1546.1:1998, *On-site Domestic Wastewater Treatment Units Part 1: Septic Tanks.*

AS/NZS 1547:2000, *On-site Domestic Wastewater Management.*

AS/NZS 5667.1:1998 *Water Quality – Sampling Part 1: Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples.*

DR 1546.3 *Aerated Wastewater Treatment Systems Standards Australia & New Zealand.*

EPA Victoria 1996, *Code of Practice – Septic Tanks On-site Domestic Wastewater Management* EPA Publication 451, March 1996, Victoria.

EPA Victoria 1996, *Guidelines for Wastewater Reuse*, EPA Publication 464, March 1996, Victoria.

EPA Victoria 1997, *Code of Practice for Small Wastewater Treatment Plants*, EPA Publication 500, June 1997 Victoria.

Environmental and Health Protection Guidelines On-site Sewage Management for Single Households, NSW Department of Local Government, NSW Health, et al.

EPA Victoria 2000, *A Guide to the Sampling and Analysis of Waters, Wastewaters, Soils and Wastes*, EPA Publication 441, 7th edition, March 2000, Victoria.

Standards Australia/New Zealand 1998 AS/NZ 5667.1:1998, *Water Quality – Sampling, Part 1: Guidance on the Design of sampling Programs, Sampling Techniques and the Preservation and Handling of samples*, Standards Australia NSW.

Guidelines for Sewage Systems - Use of Reclaimed Water Agriculture and Resource Management Council of Australia and New Zealand, Australian and New Zealand Environment and Conservation Council, National Health & Medical Research Council November 2000