

Clause	Description	Requirement	Supporting Document
1.5	Planning and Design Responsibilities	Design /Approval process to be in accordance with SA Water requirements:-	Pt1 – 1.5 (Pg 2)
1.5.3	Design responsibilities Vacuum Sewer Location	All mains laid in SA are to meet the requirements of SERVICES IN STREETS. A code for the Design of Infrastructure Services in New and Existing Streets	
1.6.3	Objectives of the System Design	System Design - additional requirements	Pt1 – 1.5.3 (Pg 3)
2.7	Staging	To be in accordance with details shown:-	Pt1 – 2.7 (Pg 4)
3.7	Easements	To be in accordance with details shown:-	Pt1 – 3.7 (Pg 4)
3.12	Obstructions and Clearances	To be in accordance with details shown:-	Pt1 – 3.12 (Pg 7)
6.3	Vacuum Station layout	All vacuum stations shall have an odour control system installed.	
9.6.1	Divisional Valves	Authorised valves with PE tails can be used in lieu of flanged valves on PE mains Divisional valves SHALL BE CLOCKWISE CLOSING	
9.6.3	Divisional Valve Covers	Valves shall be mounted within standard 450 mm DI street boxes with the cover marked SEWER	
10.1.2	Collection Chamber Location	To be in accordance with details shown:-	Pt1 – 10.1.2 (Pg 8)
10.1.3	No. of Properties Connected	To be in accordance with details shown:-	Pt1 – 10.1.3 (Pg 9)
12.5.1	Valves	Only CLOCKWISE CLOSING valves shall be used in SA Water's infrastructure	
14.2.5.4	Pipe embedment	Vacuum and pumped mains are to be embedded in packing sand which meets the requirements of TS 4	
14.2.11.1	Pipeline Anchorage	All in-line valves are to be anchored	
19	Design Drawings	To be in accordance with details shown:-	Pt1 – 19 (Pg 9)

To be used with WSA 06-2008 V1.2

SA Water Supplementary Documentation

Vacuum Sewerage Code - Part 1 (Design)

Related Requirements

Designers are required to purchase a copy of the WSA Vacuum Sewerage Code of Australia (WSA 06) prior to commencing the design.

Gravity sewers will always be SA Water's preferred option for their sewerage network, but Vacuum Sewers can be considered as an alternate option where gravity systems are proved to be not suitable.

Project specific approval must be obtained from SA Water before commencing any design based on the Vacuum Sewer System.

Pt 1 – 1.5 Planning and Design Responsibilities

The Design/ Approval Process

The Proponent/ Developer (and their system Designer) of a vacuum sewerage system, will need to go through the following two stage process to gain SA Water Approval.

Stage 1 Hold an initial meeting with SA to agree the key parameters for a study of the potential technologies that can be used to service the development.

The Developer and/or the developer's designer are required to bring the following to that initial meeting:

- A clear indication of the preferred type of vacuum sewerage technology for the particular application.
- A preliminary vacuum sewerage layout drawing.
- A summary of capital and operational costs, clearly demonstrating that a vacuum sewer system will be more cost effective than conventional gravity sewerage, based on a 25 year NPV basis. All assumptions made in that process need to be identified and listed and it must also include the Developer's contributions towards the costs.
- Details of the flows likely to be discharged into SA Water's sewerage system. These should also detail all of the stages of the particular development (if applicable) so that a discharge point can be determined into SA Water's sewers.
- Details of the Designer's experience with vacuum sewerage systems, including examples of where they have designed these systems before.
- Adjoining land zonings.
- Topographic considerations, including catchment boundaries and contour information.
- Past and future development profiles, including land release projections, etc.
- Likely study area description.
- Any other information that may be pertinent to the proposed development and future surrounding developments.

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Following the initial meeting, SA Water will indicate in writing if vacuum sewerage can be pursued in the Development Application.

Stage 2 Second meeting with SA Water so that final approval to use vacuum sewerage in the Development Application can be given, conditional upon:

- The production of a final design that meets the design requirements, as set out in the design manual.
- Proof that no odour will be generated in relation to the discharge from the vacuum sewerage system, and further verification that the quality of effluent produced will not add difficulties to the treatment plant. This includes details of any in main treatment or odour suppression equipment.
- Confirmation of the type of collection pits to be used in the development, and the number of spare vacuum interface valves being provided. These units will need to meet the requirements spelt out in this design manual and SA Water's Technical Specification.
- Environmental impacts of the proposal.
- How the remainder of the subdivision is to be serviced, if the application is only for part of the development.
- Details of pipes and fittings to be used.

Final Approval will be given by SA Water in writing.

Pt 1 – 1.6.3 – Objectives of the System Design

The following primary goals/ objectives are in addition to those specified by WSAA and are a requirement for any vacuum sewerage installation in South Australia:

- Ensure the reticulation and property mains remain clear of any solids accumulation.
- Retain the sewage in the mains for a minimum time to avoid it becoming septic and thus difficult to treat.
- Ensure that the vacuum in the pipeline does not exceed the allowable operating capacity of the pipe and fittings.
- Ensure that vacant properties can be connected with relative ease at a later date.
- If required, ensure the on property installation results in minimal inconvenience to the resident, by having a once on and off the property approach for the installation and commissioning of the Collection Chamber and the Vacuum Interface Valve.
- If required, ensure the involvement of the property owner in the design of the property layout in an attempt to meet their reasonable expectations, whilst still complying with the general thrusts of this design manual.
- Ensure there is minimal general inconvenience in the areas where the system is being installed.
- Ensure the system will operate satisfactory when only a minimal number of properties are connected. This needs to be particularly focussed on in new subdivisions, where development may take some time to reach the critical numbers the system was designed on.
- Minimise overall costs to the community in the installation of the sewerage system whilst still meeting the design objectives and requirements for the particular technology.
- Ensure the technology is supported by appropriate maintenance arrangements so that the installation of such a system will not disadvantage those that have vacuum sewerage systems in comparison with conventional gravity systems.

Pt 1 – 2.7 – Staging

All staging proposals are to be developed in conjunction with SA Water.

Note:

Where the load on the vacuum main may fluctuate considerably during the year, the Designer should give consideration to the use of a pressure sewer system which is the preferred option for fluctuating loads. Typical examples of this type of application will be caravan parks and camping areas particularly in beachside areas, where the population will vary considerably on a seasonal basis as well as areas set aside for special events.

Pt 1 – 3.7 – Easements

All sewerage easements shall be vested in the name of the South Australian Water Corporation.

Collection chambers may only be located inside a property boundary, with the approval of SA Water. In such cases, an access easement is to be provided. Access and easement sizes are to be sufficient to allow maintenance vehicle access (the size is to be approved by SA Water).

SA Water easements **may only be shared** with stormwater pipes (see below). Other authorities and utilities, especially power, gas, telecommunications etc are not permitted to share the SA Water sewer easement to accommodate their respective facilities, essentially due to OHS&W implications for SA Water maintenance and operational personnel, or personnel contracted by SA Water.

Location of Sewers/Easements

All vacuum sewers and appurtenances shall normally be located in roadways in accordance with the requirements of 'SERVICES IN STREETS' – the code for Design of Infrastructure Services in New and Existing Streets'.

Where this is neither practical nor possible to achieve (eg due to topographical or road layout design), vacuum sewers may be located in easements (taken specifically for that purpose).

Vacuum sewers shall **not be** located in easements to achieve capital cost minimisation where satisfactory routes in roads are available and viable, as this adversely affects SA Water's access and ongoing maintenance requirements.

Easement alignments may be located as follow:-

- across the rear of an allotment
- along the side of the allotment, or
- any other agreed alignment eg crossing parks and reserves.

Vacuum sewer easements shall generally be located in the allotment served by that sewer, or if the property adjoins a park/reserve, the vacuum sewer **may** be located in the park/reserve, providing:-

- suitable vehicle access to the vacuum sewer can be demonstrated to SA Water
- the vacuum sewer pipeline is well clear of existing or proposed locations of trees and shrubs, in accordance with the minimum clearances specified in the Supplementary Documentation WSA 06 Part 1 - 3.12

The minimum horizontal clearance between the outside face of the sewer and an existing or proposed building or structure shall be as detailed in the Supplementary Documentation to WSA 06 Part 1 – 3.12

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Minimum Cover in Easements

The minimum cover to mains in any easement will be 600 mm unless specifically authorised by SA Water.

Categories of Easements

Easements are divided into Category 1 and Category 2 easement and these are detailed below.

CATEGORY 1	Not Shared with Stormwater Pipes
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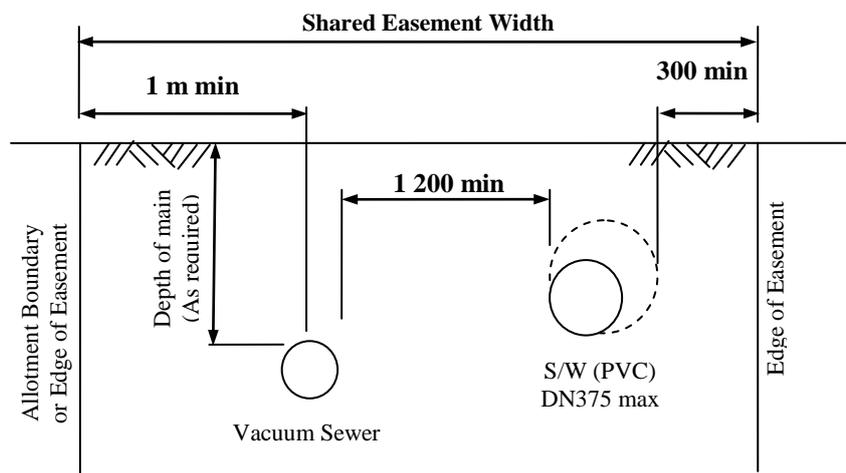
Easement width shall be 2.5 m and the pipe shall be located centrally in non shared easements.

Where there are immovable obstacles along the centreline of the sewer easement, or encroaching upon the easement (eg nearby trees) the sewer centreline can be located 1.0 metre off the easement boundary that is most distant from any building or proposed building.

CATEGORY 2	Shared Sewer and Stormwater Easements
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SA Water will share sewer easements with stormwater pipelines up to DN375 maximum, providing the S/W pipes have water tight joints (eg PVC pipes)

Typical widths of shared easements shall be a minimum of 3 m and the spacing to edge of easement shall be 1 metre. See sketch below:



Category 2 (Shared Easement) Pipework Arrangement

Where a sewerage easement is shared with a stormwater pipeline, the Council/Developer shall obtain their own stormwater easement from the landowner.

The stormwater easement may overlap either a portion or the whole width of the SA Water sewer easement.

The shared easement arrangement must be approved by the Council (or whoever is the owner of the stormwater pipeline).

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Under no circumstances shall the sewer and stormwater pipeline arrangement (as shown in sketch above) be reversed, resulting in the sewer being closer than the prescribed distance from the allotment boundary/ edge of easement.

SA Water takes no responsibility for the stormwater pipeline, other than any damage caused to the stormwater pipeline by SA Water personnel or personnel contracted by SA Water.

Easements obtained under Developer Contracts

The Developer shall be responsible for all costs associated with the acquisition of sewer easements that are required within the development.

Easements within the development shall be established on the basis of the Final Plan of the Development. The final plan shall be prepared and lodged with the Development Assessment Commission by the Licensed Surveyor engaged by the Developer.

Where easements external to the development are required, the Developer may acquire the easements independently or may request that SA Water acquire the easements at the developers cost.

Pt 1 – 3.12 – Obstructions and Clearances

SA Water has set minimum horizontal clearances between the vacuum sewer and any wall, building or tree. The allowable clearance varies between existing and proposed structures.

Clearances from Existing Structures:

The minimum horizontal clearance between the barrel of the vacuum sewer and any **existing** wall or building shall be 1.0 metre.

Reduced clearances may be possible with site specific approval from SA Water

Clearances from Proposed Structures

The minimum horizontal clearance between the barrel of the vacuum sewer and a **proposed** wall or building (to be erected after installation of the pressure main) shall be 1.5 metres unless specific approval for a smaller distance is obtained from SA Water.

Clearances from Trees

Clearances between the vacuum sewer and trees shall be the greater of the following two conditions:-

- minimum 1.5 metres lateral clearance between the face of the vacuum sewer and the trunk of a mature small tree, or
- Larger clearances (covering many tree types) as determined by the SA Water “Tree Planting Guide”.

Note:- Where it is impossible to attain the necessary lateral clearances from trees, it may be practical to tunnel beneath (or alongside) the tree/s, provided the tree type and root growth will permit such action and provided the tunnelling will not affect or endanger the health OR stability of the tree/s. This action, on a case by case basis, must be supported by a written opinion to SA Water from a specialist tree consultant who is qualified and accredited to provide such professional judgements (eg horticulturist and/or arboriculturist).

Pt 1 – 10.1.2 – Collection Chamber Location

Collection Chambers are NOT to be installed on private property or road reserves without location specific approval from SA Water.

Location of collection chamber will be based on the proximity of other services, e.g. property driveway, water supply, power (including light poles etc), telecommunications and gas.

Pt 1 – 10.1.3 – Number of Properties Connected (per Collection Chamber)

The maximum number of property connections attached to a single collection chamber is 4

Individual property connections may be interconnected once outside the boundary of each property, prior to connecting to the vacuum collection chamber.

Each property connection is to include a standard connection IP adjacent to the property boundary (as for gravity sewers). Each property is to have a 100mm downstream vent, on the internal drainage system, as specified in AS/NZS 3500.2.

Part 1 – 19 Design Drawings

The reticulation drawings must as a minimum show the following:

- A Plan Drawing in accordance with SA Water Sewer drawing practices, of the proposed location and route of all pipelines, indicating the location, relative to the property boundary. Tie lengths are to be used.
- Pipe sizes (and pipe class if there are any deviations from the minimum class).
- The location of other services in close proximity, where these are known, and where these may need to be crossed.
- The location of any proposed flushing points, isolating valves etc. Tie lengths should be used where possible.
- Reference to any survey pegs or property boundaries that mark the pipelines proposed location.
- Sections to be directionally drilled.
- The location of lateral spurs to connect properties.
- Boundary of any zones (where applicable).
- A unique number and references to the property design drawings.
- Nature of host soils expected, such as soil, rock, sand, water charged ground.
- A Longitudinal Section Drawing in accordance with SA Water Sewer drawing practices, showing the ground profile and depth of the main and services crossing the reticulation pipework. Grading of the reticulation main is not required.

The Designer should ensure the drawings do not become too cluttered with detail and if necessary they should create an additional plan onto which notes and tables are moved.

Drawing Requirements

Design Drawings are to be prepared in accordance with the following criteria:-

- All Drawing are to be submitted on A1 sheets, together with an A3 reduction. In addition the drawings are to be submitted in an electronic format compatible with SA Water's GIS system.

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- All Drawings shall have title blocks, alteration blocks, margins etc. in accordance with the South Australian Water Corporation's Standard Drawing format.
- A legend detailing symbols and standard abbreviations used on the drawing shall be included on the relevant drawing.
- Dimensions and distances shall be shown in metres and shall be to two decimal places.

Composition of Drawings

The Drawings shall:

- Clearly define and detail the full extent of the Works being designed under the Contract.
- Show all interacting services and facilities (including common services, water and stormwater drains) on the plan and longitudinal section views of the Drawings where they cross sewers, connections, pumping mains or appurtenances being designed, or where those services are in close proximity to and/or running parallel to the sewers, connections or pumping mains being designed.
- Provide sufficient information to enable the accurate setting out of the Works by the Constructor.
- Where narrow roads are involved (particularly narrow curvilinear roads), the kerb alignments shall also be shown in addition to the other relevant services and features.

Cover/Front Sheet

The Front Sheet shall comprise:-

Plan View

- Correlating the Works to existing infrastructure and existing roads.
- Drawn to a scale of 1:500 or 1:1000 depending on the allotment size and ensuring that after construction of the scheme, the 'As-Constructed' information can be readily and clearly recorded to a standard suitable for microfilming.
- As a guide, where allotments in the development have frontages less than 15 metres wide, then the Drawing shall be at a scale of 1:500.

Location Plan

For remote schemes, or for larger schemes (involving several plan drawings) a separate location plan to a scale of 1:10 000, shall be drawn on the Front Sheet depicting the entire Works, correlating the new Works to existing infrastructure and existing roads.

Limit of Contract

Clearly defining the full extent of the works in the contract.

Permanent Survey Mark (PSM) Details

Detailed to a large scale, showing the PSM location, ties, identification number and elevation.

Temporary Bench Mark (TBM) Details

Selected at a location close to the starting point of the Works.

Foundation Conditions

The Drawings shall either:

- document that no special foundation treatments are necessary, or
- specify all details of any special foundation treatments determined by the Designer.

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In addition, the Drawings shall :

- specify the extent, and all design details of, any special methods necessary to control groundwater flow along the embedment and trench fill material.
- specify all sections of the system where the Constructor will need to pay particular attention to controlling groundwater prior to excavation to prevent heave of, or loss of density in, the sewer foundation.

Connections

All connection information (including existing connections), shall be shown on the plan view of the Drawings and show:

Technical Audit of Drawings

After preparing the Drawings for the pressure sewerage scheme, the Designer shall certify the originals of the Drawings to be correct and shall submit one paper print of each of the endorsed originals free of charge to SA Water, for technical audit by SA Water.

Drawings shall not be submitted to SA Water for technical audit until determination fees (applicable to Developer funded schemes only) have been made to SA Water AND drawing numbers and contract numbers have been allocated.

If alterations are required, SA Water shall return the Drawing prints to the Designer (at the Designer's expense) for changes or corrections needed to obtain compliance.

Upon carrying out those changes or corrections, the Designer shall re-submit free of charge the corrected originals of the Drawings to SA Water for ratification (and also return the marked-up paper check prints).

Audit of the Drawings by SA Water shall not relieve the Designer from the full responsibility for the correctness of the Design and Drawings, except insofar as any error in or omission from any document which SA Water has issued, or caused to be issued to the Designer.

Issue of Drawings

The originals of the endorsed Drawings shall be returned to the Designer who shall immediately provide (within one working day), one transparent film copy of each Drawing to SA Water. Where applicable, the Designer shall also provide the appropriate SA Water Regional Offices with copies of the Drawings.

The Designer shall also provide the Constructor with as many prints of the Drawings as the Constructor may require.

Any problems caused by delays in the distribution of these copies to all parties, including any problems or delays with the administration of the Contract arising from these delays, shall be fully borne by the Designer.

Amendment of Drawings

If there is a need to amend the Drawings subsequent to their issue, the Designer shall resubmit the amended Drawings, and the procedures described shall apply again. These resubmitted Drawings shall be updated to include all changes (eg gradient or alignment changes, changes to allotment layout or road layouts etc). The Drawing title block shall be updated to clearly define these amendments and the Drawing number shall be adjusted by the inclusion of an 'A' or 'B' etc to designate the status of the changes.

Recording As-Constructed Information

Ultimately these design drawings will become the As Constructed drawings for the reticulation system and will be amended to record:

- Length of mains laid
- Bored sections
- Any deviation to pipeline route
- Actual pipe details
- Actual host soils encountered
- Depths of pipelines
- Actual location of all fittings and markers.
- Lateral spurs
- Location (approximate) of any marker posts to be used, to show the location of the pipelines.

The Designer or a nominated representative shall mark up the original of the latest edition (or amendment) of the Drawings with the 'As-Constructed' data, as referenced in WSA 06 Part 3

Document Update Information

Date	Change Type	Page Number(s)	Details
July 2014	Clarification	A3	Emphasize order of importance
July 2014	Update	A3	Easement requirements for private property
July 2014	Update	A6	Collection chamber not to be on private property
July 2014	Update	A7	Clarification on connection to collection chamber

To be used with WSA 06-2008 V1.2