

0076 SEWERAGE SYSTEMS – RETICULATION (DESIGN)

1. General

1.1. Responsibilities

1.1.1. General

Requirement: Provide design and documentation for a sewerage system to transport sewage from properties to the treatment plant or to a defined discharge point on an existing sewerage reticulation system, conforming to the requirements of WSA codes and the Water Agency, as documented.

1.2. Cross References

1.2.1. General

Requirement: This is not a self-contained design document, conform to the following worksection(s);

- 0010 Quality Requirements for Design

1.3. Standards

1.3.1. General

Gravity sewerage system: To WSA 02 Part 1.
Pressure sewerage system: To WSA 07 Part 1.
Vacuum sewerage system: To WSA 06 Part 1.

1.4. Interpretation

1.4.1. Abbreviations

General: For the purposes of this worksection the following abbreviations apply:

- MH: Maintenance hole.

1.4.2. Definitions

General: For the purposes of this worksection the following definitions apply:

- Gravity sewerage systems: WSA 02 Part 0;
- Vacuum sewerage systems: WSA 06 Part 0;
- Pressure sewerage systems: WSA 07 Part 0.

2. Pre-Design Planning

2.1. General

2.1.1. Environmental Impact Assessment

Requirement: Provide evidence that impact on the environment has been considered as part of the design to satisfy the requirements of relevant legislation.

2.1.2. Concept plan

Requirements: Provide concept plans to Council at 50% and 80% completion for perusal and comment.

2.1.3. Critical infrastructure protection

All hazards risk assessment: In consultation with Council, conduct a risk assessment addressing critical aspects of the reticulation system.

2.2. System Planning

2.2.1. Planning principles

Future gauging needs: Allowance for future needs shall be in accordance with WSA and in consultation with Council.

The area to be served shall be determined in consultation with Council and may require provision for an upstream sewer.

The depth of the sewer shall be sufficient to allow for 90% of each lot to be serviced.

All lots shall be able to be serviced by gravity sewers wherever possible.

The designer shall confirm the design criteria with Council and shall design a gravity pipeline distribution system with pump stations and rising mains, where necessary to comply with the requirements of this specification, to transport fresh sewage, or common effluent for treatment. Where not specified in this specification the default reference shall be WSA 02, WSA 07 and WSA 06 where applicable.

Pressurised common effluent or vacuum discharges shall only be considered after consultation with Council.

The design shall not provide for common effluent or vacuum discharges to gravity sewers or conventional wastewater treatment plants without the concurrence of Council.

2.2.2. Concept design for pressure sewers

Provide concept designs to Council at 50% and 80% completion. Concept plans shall show relevant information used in the design such as catchment area, flows, collection/pump unit type, discharge point, recommended staging, network layout, entrapped air/vacuum management and any other specific requirements outlined by Council.

2.3. Flow Estimation

2.3.1. General

Design flows for residential developments shall be determined in accordance with WSA and in consultation with Council. For sewers serving industrial areas and developments not specifically listed in WSA, the designer shall obtain concurrence from Council for design flows used.

Design flow verification: Design flow limits for pressure sewers for certification by the system supplier.

2.4. Subsidised Schemes

2.4.1. Funding

Government grant funds: If the works form part of a contract attracting Government grant funds, identify the following:

- Items which are not of the least cost option, that:
 - Are intended to have a much longer design life than the typical asset design lives listed in WSA 02 Table 1.2 for gravity sewerage, WSA 07 Table 1.1 for pressure sewerage and WSA 06 Table 1.1 for vacuum sewerage;
 - Do not meet the project objectives and the requirements of the various agencies for the least net present value (NPV) but may become the preferred option for construction.
- Particular equipment which is procured without relevant competition through tendering.
- Duplication of equipment or unit processes in a system configuration.

2.5. Consultation

2.5.1. Council and other authorities

Requirements: Consult with the Council and other relevant authorities during the preparation of design. In addition to the requirements of this worksection, identify the specific design requirements of these authorities.

2.5.2. Public consultation

Requirements: Undertake public consultation on design in conformance with Council policy.

2.5.3. Utilities services plans

Existing services: Obtain service plans from all relevant utilities and other organisations whose services exist within the area of the proposed development. Plot these services on the relevant drawings including the plan and cross-sectional views.

3. Design Criteria

3.1. Materials

3.1.1. General

Materials shall be in accordance with WSA.

Asbestos cement shall not be used.

Concrete pipes shall not be used.

The designer shall provide for sewer reticulation pipes to be colour coded to easily differentiate from other services and shall be shown on the drawings accordingly (refer WSA 02 table 4.1).

The designer shall ensure that pipe is ductile iron (DI) compatible where necessary, taking note of the specific class of any existing pipeline infrastructure that will be affected by the design.

3.2. Detail Design

3.2.1. Detail design considerations

In general, all design works shall be in accordance with WSA 02, WSA 07 and WSA 06 where applicable.

Network layout shall generally be in accordance with relevant WSA specification and any specific requirements of Council.

The depth of sewers shall be such that 90% of each lot can be serviced.

The designer shall provide evidence that environmental impacts have been assessed and any requirements of relevant environmental legislation have been satisfied. This shall include the consideration of tree and vegetation removal, flora and fauna and any cultural heritage considerations.

Easements:

- Easements shall be minimum 3m wide;
- Sewers shall be placed centrally within the easement.

Disused sewers shall be removed and disposed of in accordance with Council policy. Trenches shall be backfilled with competent material and compacted to meet Council's specific requirements.

3.2.2. Horizontal alignment of sewers

Where it is necessary for sewers to be located outside of the development, the designer shall obtain written approval from the affected property owner. Preparation of any application for approval from an affected property owner shall constitute a witness point. The principal shall advise whether the option to review and direct on the application is taken at the time of notification by the designer.

Where sewers are proposed to be located within existing road reserves, the designer shall check that the sewers do not conflict with other utility services and locate the sewers in accordance with established protocols (WSA).

Sewers located on private property must be located in an easement of minimum width three (3) metres. Unless there are compelling reasons to the contrary, the sewer shall be located within the centre of the easement. A registered surveyor shall survey easements and pipelines.

Railway reserves: The designer shall consult with the rail authority regarding specific requirements for railway reserves and provide evidence of approval from the rail authority to Council.

3.2.3. Pipe sizing and grading

Sewerage design charts: To AS 2200.

Pipe sizing and grading shall be as per WSA 02, WSA 07 and WSA 06.

3.2.4. Vertical alignment of sewers

All vertical alignment requirements shall be in accordance with WSA 02, WSA 07 and WSA 06 where applicable.

3.3. Property Connection

3.3.1. Location of property connection points

Pipeline alignments shall be such that no property connection sewer is more than 10m in length.

The designer shall ensure that connections to the pipeline shall be not more than 1500mm in depth below the finished surface.

3.4. Pressure Sewerage

3.4.1. Hydraulic design – design inputs and outputs

Approved design methodology: In accordance with WSA 07, WSA 06.

Sanitary drainage flows: In accordance with WSA 02, WSA 07 and WSA 06.

Discharge point and flow rates of discharge: In accordance with WSA 07, WSA 06.

Maximum detention time: In accordance with WSA 02, WSA 07 and WSA 06.

Volume of sewage in each tank: In accordance with WSA 02, WSA 07 and WSA 06.

3.4.2. Hydraulic design – design flows and their variability

In accordance with WSA 02, WSA 07 and WSA 06.

3.4.3. Hydraulic design – sizing of pressure sewers

In accordance with WSA 02, WSA 07 and WSA 06.

Thrust blocks shall be designed in accordance with WSA 07.

3.4.4. Pressure sewer design – provision for condition monitoring, sampling and maintenance

In accordance with WSA 02, WSA 07 and WSA 06.

3.4.5. On-property design

In accordance with WSA 02, WSA 07 and WSA 06.

3.5. Maintenance Structures

3.5.1. Location of maintenance structures

Maintenance structures shall be generally placed in accordance with WSA 02.

All upstream ends of sewers shall terminate in a maintenance hole if the upstream end is more than 30m from the downstream maintenance hole.

3.5.2. Special considerations for connection of new sewers to existing sewers

Connections to existing maintenance holes or sewers of the existing sewerage system shall be designed in consultation with Council.

3.5.3. Maintenance holes

In accordance with WSA 02 and Council specific requirements.

Step irons shall be provided to all maintenance holes where the depth from top of cover to the invert of the outlet pipe exceeds 1200mm. Step irons shall be of 24mm diameter.

Access covers shall be manufactured in accordance with AS 3996.

3.6. Appurtenances

3.6.1. Valves – general

Shall be in accordance with WSA 07 section 5.3 in general.

3.6.2. Isolation valves

Shall be in accordance with WSA 07 section 5.4.

3.6.3. Air release and vacuum break valves

Shall be automatic combination valves in accordance with WSA 07 section 5.5.

3.6.4. Flow measuring device

Shall be shown in locations specified by Council.

3.6.5. Surface fittings

Shall have trafficable covers fit for purpose. The designer shall allow for clear identification and delineation from other utilities.

3.6.6. Valve pits and access

The designer shall take into account Occupational Health and Safety requirements in providing for access and inspection covers.

Ladders shall comply with AS1657 and applicable Health and Safety legislation.

3.6.7. Appurtenance location marking

The designer shall take into account the location and type of valve required considering maintenance and repair requirements and access for lifting equipment.

3.7. Structural Design

3.7.1. Geotechnical considerations

The designer shall take into account the geotechnical characteristics of the site in the design to ensure satisfactory performance over the design life of the system.

3.7.2. Special embedment concrete and stabilised supports

In accordance with WSA 07.

3.7.3. Above ground crossings

In accordance with WSA 07.

3.7.4. Pipe cover

Minimum depth of cover shall be as per the requirements of WSA 07 Section 9 and WSA 07 Part 4 relevant standard drawings.

3.7.5. Pipeline anchorage

Pipeline anchorage and restraints shall be as specified in WSA 07.

3.7.6. Bulkheads and trenchstops

As per WSA 07.

3.7.7. Buoyancy

Provide evidence that buoyancy has been considered and apply approved measures to resist buoyancy.

4. Documentation

4.1. General

4.1.1. Approvals

Requirement: Document the approval conditions advised by the appropriate authority which contribute to the basis for the design of the sewerage reticulation system.

Concept plan: Document and review the concept plan for the sewerage system.

4.1.2. Design reports

Requirements: Provide a design report including the following:

- Design criteria;
- Site investigation reports supporting the design;
- Calculations, studies and references supporting the design;
- Demonstrated conformance with the approved concept plan and the requirements of WSA 02 clause 10.1 and WSA 06 clause 18 for vacuum sewerage;
- Details of any hazardous structural features, material, procedures or practices that remain in the design;
- The use of chemical dosing to avoid excessive septicity;
- Issues related to any proposed emergency relief structures.

4.1.3. Design certification

Requirement: Provide a signed and dated design certificate.

4.2. Drawings

4.2.1. General

Requirements: Provide drawings and/or computer output defining the works and assumed operating and maintenance procedures to WSA 02 clause 10.2 and WSA 06 clauses 19.1 and 19.2 for vacuum sewerage.

4.2.2. Drawing content

Requirement: Provide drawings to the requirements of WSA 02 clause 10.2 and WSA 06 clause 19.2 for vacuum sewerage.

4.2.3. Work as Executed drawings

General: Provide an additional set of final construction drawings for the purpose of recording the Work as Executed by the Contractor.

Required format: AutoCAD .dwg and pdf.

4.3. Specifications

4.3.1. Construction documentation

Requirement: Prepare technical specifications using the AUS-SPEC Construction worksection templates from the National Classification System workgroups 02, 03, 11 and 13.

5. Annexure

5.1. Annexure – Referenced Documents

The following documents are incorporated into this worksection by reference:

AS 2200	2006	Design charts for water supply and sewerage
WSA 02	2014	Gravity Sewerage Code of Australia
WSA 06	2008	Vacuum Sewerage Code of Australia
WSA 07	2007	Pressure Sewerage Code of Australia