

QPRC



**QUEANBEYAN PALERANG
REGIONAL COUNCIL**

**DEVELOPMENT DESIGN
SPECIFICATION**

D12

SEWERAGE SYSTEM

VERSION 1 – JANUARY 2019

Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments for development.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
<i>Version 1 QPRC Amendments to AUS-SPEC Document</i>					
1	<i>Provide for Sewerage to other areas</i>	D12.04	A	HB	11/04
2	Gravity sewer only from lots, no private pumps	D12.05	AM	HB	11/04
3	Superimposed loads	D12.06	A	HB	11/04
4	Step iron, minimum height MH	D12.08	M	HB	11/04
5	Maintenance shafts not to be used	D12.09	M	HB	11/04
6	Delete use of some pipe materials	D12.10	O	HB	11/04
7	Relativity of Service	D12.10	A	HB	11/04
8	Clarify location of connection depth	D12.10	M	HB	11/04
9	Water hammer analysis required for Rising mains	D12.10	A	HB	11/04
10	Rising main minimum size specified	D12.10	A	HB	11/04
11	Delete reference to Polyethylene pipe joints	D12.11	O	HB	11/04
12	Delete use of uPVC gravity pipes, uPVC & PVC-M pressure pipes, Polyethylene and GRP pipes	D12.13 D12.14 D12.18 D12.19	MO	HB	11/04

SEWERAGE SYSTEM – QUEANBEYAN PALERANG

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
13	Pump Stations to PWD standards	D12.20	A	HB	11/04
14	Pumps to Sewer Authority's requirements	D12.21	A	HB	11/04
15	Ambient conditions changed to - 10°C	D12.22	M	HB	11/04
16	Telemetry to comply with existing	D12.25	O	HB	11/04
17	Venting, Odour control to be provided	D12.26	A	HB	11/04
18	Approval of design before start of construction	D12.27	A	HB	11/04
19	Drawing scale change	D12.27	M	HB	11/04
20	Approval of pump station details required	D12.28	M	HB	11/04
21	Drawing size amendment	D12.28	A	HB	11/04
22	Deemed to Comply	D12.30	A	HB	11/04
23	Concrete encasement added	D.12.10.6	A	KD	9/05
24	Requirement for generator connection to pump station added	D12.22.6	A	KD	9/05
25	Sewer Authority approval of design added,	D12.27.1	A	KD	9/05
26	Additional requirement for longitudinal section to show other services	D.12.27.2	A	KD	9/05
27	Drawing size altered to A1	D.12.27.4	A	KD	9/05
28	Drawing size altered to A1	D.12.28.3	A	KD	9/05
29	Hold Point for preliminary sewer design	D.12.06.1	A	BP	1/06

SEWERAGE SYSTEM – QUEANBEYAN PALERANG

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
30	Witness Point changed to Hold Point	D.12.27.1	A	BP	1/06
31	WAE plans - Hold Point	D.12.31.1	A	BP	1/06
32	Sewer to be concrete encased near storm water conduits	D.12.10.6	A	BP	1/06
33	RISS added	D12.01	A	MC	05/02/13
34	WSA code references updated	D.12.03	M	MC	05/02/13
35	Requirements for Maintenance Holes varied, sewer master plan required	D.12.08	A	MC	05/02/13
36	Maintenance Shafts permitted at Googong	D.12.09	A	MC	05/02/13
37	uPVC and PE & PP pipe allowed, Hold Point inserted, property connection specified, replacement in ductile iron pipe where clearance to stormwater is insufficient	D.12.10	A	MC	05/02/13
38	uPVC pipe standards inserted	D.12.13	A	MC	05/02/13
39	DICL PN35 flange class specified	D12.15	A	MC	05/02/13
40	PP pipe standards inserted	D.12.19	A	MC	05/02/13
41	WAE requirements amended	D12.31	A	MC	05/02/13
42	Standard Drawings added	D12-A	A	MC	05/02/13
43	Additional clauses added prohibiting curved sewers but allowing manufactured bends	D12.07	A	MC	05/02/13
44	Standard drawings added	D12-A	A	KD	05/02/13
45	Design Requirements added	D12-B	A	KD	12/08/14
46	WSA02 updated to Version 3.1	D12.03	A	KD	6/01/15

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Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
47	Use of galvanised step irons omitted	D12.08	O	CS	12/04/18
48	Property connection requirements updated	D12.10.8	M	CS	13/11/18
49	Deem to comply omitted	D12.30	O	CS	13/11/18
50	Reference to SEW-1303 Drop structure manholes added	D12.08	A	CS	13/11/18
51	SEW-1108 & SEW-1306 omitted	D12-A	O	CS	13/11/18
52	Property connection detail added	Fig D12.1	A	CS	13/11/18
53	Use of uPVC pipe	D12.14	A	CS	23/11/18
54	Use of VC pipe prohibited	D12.16	M	CS	23/11/18
55	Use of steel pipe prohibited	D12.17	M	CS	23/11/18
56	Use of PE pipe amended	D12.18	M	CS	23/11/18
57	Requirements for insitu fabrication	D12.20	A	CS	23/11/18
58	Emergency Storage requirement added	D12.20.9	M	CS	23/11/18

DEVELOPMENT DESIGN SPECIFICATION D12 –

SEWERAGE SYSTEM

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DEVELOPMENT DESIGN SPECIFICATION D12

SEWERAGE SYSTEM — VERSION 1

GENERAL

D12.01 SCOPE

1. The work to be executed under this Specification consists of the design of a sewerage system either as a stand-alone project or part of a development. **Design**
2. The Specification contains procedures for the design of the following elements of the sewerage system: **Elements**
- (a) Gravity sewers including junctions and property connection sewers;
 - (b) Common effluent sewers both gravity and pressurised;
 - (c) Reduced Infiltration Sewerage Systems (RISS);
 - (d) Vacuum sewer system;
 - (e) Maintenance holes, maintenance chambers, maintenance shafts, flow gauging chambers and other structures;
 - (f) Rising mains; and
 - (g) Pump stations.
3. The design of gravity sewer systems and pump station components shall comply with the Water Services Association of Australia's publication SEWERAGE CODE OF AUSTRALIA unless specified otherwise herein and should be constructed in accordance with the DEVELOPMENT CONSTRUCTION SPECIFICATION - SEWERAGE SYSTEM – VERSION 1. **Compliance**
4. Where the Specification forms part of a contract attracting Government Grant funds, the Principal shall identify **Subsidised Schemes**
- (a) Items which are not of the least cost option, that
 - (i) Are intended to have a much longer design life than the normal asset service life detailed in the Asset Management Guidelines of the International Infrastructure Management Manual.
 - (ii) Do not meet the project objectives and the requirements of the various Authorities for the least Net Present Value (NPV) but may become the preferred option for construction.
 - (b) Particular equipment which is procured without relevant competition through tendering.
 - (c) Duplication of equipment or unit processes in a system configuration.

D12.02 OBJECTIVE

1. The objective of the sewerage system is to transport sewage or effluent from domestic properties to the treatment plant in accordance with all current relevant legislation. Consumer requirements shall be met by providing a sewer main and allowing an appropriate point of connection for each individual property. **Sewerage System**

D12.03 REFERENCE AND SOURCE DOCUMENTS

1. Documents referenced in this Specification are listed below whilst being cited in the text in the abbreviated form or code indicated. The Designer shall possess, or have access to, the documents required to comply with this Specification.

Documents

2. References to the SEWERAGE CODE OF AUSTRALIA are made where there are parallel sections or equivalent clauses to those in this Specification. Where not called up as part of this Specification, these references are identified by part and section numbers and enclosed in brackets thus (WSAA Part, Section).

Sewerage Code**(a) Council Specifications**

C402 - Development Construction Specification Sewerage System – Version 1.

The Designer shall include the requirements of the DEVELOPMENT CONSTRUCTION SPECIFICATION - SEWERAGE SYSTEM – VERSION 1.

(b) Australian Standards**Australian Standards**

References in this Specification or the Drawings to Australian Standards are noted by their prefix AS or AS/NZS. (WSA 02 Part 0 section III).

The Designer shall use the latest edition of the Australian Standards including amendments and supplements, unless specified otherwise in this Specification.

- AS 1102 - Graphical symbols for electrotechnical documentation (various)
- AS 1210:1997 Pressure vessels
- AS 1214:1983 - Hot dipped galvanised coatings on threaded fasteners (ISO metric coarse thread series)
- AS/NZS 1260:2009 PVC pipes and fittings for drain, waste and vent applications
- AS 1281 - Cement mortar lining of steel pipes and fittings.
- AS 1444 - Wrought alloy steels – Standard, hardenability (H) series and hardened and tempered to designated mechanical properties
- AS/NZS 1477:2006 PVC pipes and fittings for pressure applications
- AS 1579:2001 - Arc welded steel pipes and fittings for water and wastewater.
- AS/NZS 1594 - Hot rolled steel flat products
- AS 1631 - Cast grey and ductile iron non-pressure pipe and fittings
- AS 1646:2007 - Elastomeric seals for waterworks purposes
- AS 1657:1992 - Fixed Platforms, walkways, stairways and ladders – Design, construction and installation
- AS 1741 - Vitrified clay pipes and fittings with flexible joints - Sewer quality.
- AS 2032:2006 - Installation of PVC pipe systems
- AS 2129:2000 - Flanges for pipes, valves and fittings
- AS 2200:2006 - Design charts for water supply and sewerage
- AS/NZS 2280:2004 Ductile iron pressure pipes and fittings
- AS/NZS 2566. Buried flexible pipelines
- AS/NZS 2566.1:1998 - Structural design
- AS 2634 - Chemical plant equipment made from glass-fibre reinforced plastics (GRP) based on thermosetting resins
- AS/NZS 2648.1:1995 Underground marking tape; Part 1: Non-detectable tape
- AS 2832 Cathodic protection of metals
- AS 2832.1-2004 Pipes and cables
- AS 2832.2-2003 Compact buried structures
- AS 2837 - Wrought alloy steels – Stainless steel bars and semi-finished products

AS 2865-2009	Confined spaces
AS/NZS 3000:2007	Electrical installations (known as the Australian/New Zealand Wiring Rules).
AS/NZS 3111:2009	Approval and test specification - Miniature overcurrent circuit-breakers.
AS/NZS 3190:2009	Approval and test specification - Residual current devices (current-operated earth-leakage devices)
AS 3439	Low voltage switchgear and controlgear assemblies
AS 3439.1-2002	Type-tested and partially type-tested assemblies
AS/NZS 3500 -	National Plumbing and Drainage Code
AS/NZS 3500.2:2003	Sewerage
AS 3518 -	Acrylonitrile Butadiene Styrene (ABS) pipes and fittings for pressure applications
AS 3518.1 -	Pipes
AS 3518.2 -	Solvent cement fittings
AS 3571 -	Glass filament reinforced thermosetting plastics (GRP) pipes - Polyester based - Water supply, sewerage and drainage applications
AS 3600 :2009	Concrete structures
AS 3680: 2008 -	Polyethylene sleeveings for ductile iron pipelines.
AS 3735 -	Concrete structures for retaining liquid
AS 3735 Supp1-2001	Concrete structures retaining liquids - Commentary (Supplement to AS 3735-2001)
AS/NZS 3862:2002	External fusion-bonded epoxy coating for steel pipes
AS/NZS 3879:2006	Solvent Cements and Priming Fluids for PVC (PVC-U and PVC-M) and ABS pipes and fittings
AS 3996:2006 -	Metal access covers, road grates and frames.
AS 4024.1-2006	Series: Safety of machinery (26 parts)
AS/NZS 4058:2007	Precast concrete pipes (pressure and non pressure)
AS 4060:1992 -	Loads on buried vitrified clay pipes.
AS 4087:2004 -	Metallic flanges for waterworks purposes
AS 4100:1998 -	Steel structures
AS/NZS 4129:2008	Fittings for polyethylene (PE) pipes for pressure applications.
AS/NZS 4130:2009	Polyethylene (PE) pipes for pressure applications.
AS/NZS 4131 -	Polyethylene (PE) compounds for pressure pipes and fittings.
AS/NZS 4158:2003	Thermal-bonded polymeric coatings on valves and fittings for water industry purposes
AS/NZS 4321 -	Fusion-bonded medium-density polyethylene coating and lining for pipes and fittings
AS/NZS 4331	Metallic flanges
AS/NZS 4331.1:1995	Steel flanges
AS 4441-2008	Oriented PVC (PVC-O) pipes for pressure applications
AS/NZS 4765:2007	Modified PVC (PVC-M) pipes for pressure applications
AS 4883 - 2008	Air valves for sewerage
AS/NZS 5065:2005	Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications
AS/NZS 60269	Low voltage fuses
AS/NZS 60269.1: 2005	General requirements
AS 60947	Low voltage switchgear and controlgear
AS 60947.2- 2005	Circuit-breakers
AS 60947.5.1	Control circuit devices and switching elements - Electromechanical control circuit devices
AS/NZS 61000	Electromagnetic compatibility (EMC)
AS/NZS 61000.4.6: 2008	Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
AS/NZS 61000.6.2: 2006	Generic standards - Immunity for industrial environments
SAA HB 48: 1999	Steel structures design handbook.

Where not otherwise specified in this document, the Contractor shall use the latest Australian Standard available within two weeks of close of tenders.

(c) Other

Institute of Public Works Engineering Australia (IPWEA)

- Streets Opening Conference Information Bulletin on Codes and Practices (Sections 3 and 4 detailing locations and depths of other services).

NSW Department of Commerce

- MEW E101 - Electrical Services Minimum Requirements
- PWD - Safety Guidelines for fixed ladders, stairways, platforms and walkways for use in sewage treatment Works, pumping stations and maintenance holes.
- PWD-SD - Public Works Department Manual of Practice – Sewage Design.
- PWD-PSD - Public Works Department Manual of Practice – Sewage Pumping Station Design (May 1986).
- WS-SPEC - Technical Requirements (TRs) and Strategic products Specifications (WSAA)

Water Services Association of Australia (WSA)

- WSA 01 – 2004 - Polyethylene Pipeline Code
- WSA 02 - 2014 - Gravity Sewerage Code of Australia – Version 3.1
- WSA 03 - 2011 - Water Supply Code of Australia, Version 3.1
- WSA 04 - 2005 - Sewage Pumping Station Code of Australia – Version 2.1
- WSA 05 – 2013 - Conduit Inspection Reporting Code of Australia – Version 3.1
- WSA 06 – 2008 - Vacuum Sewerage Systems.
- WSA 07 – 2007 - Pressure Sewerage Code of Australia – Version 1.1

Building Codes Board of Australia

- Building Code of Australia - PART E1, Fire Fighting Equipment.

Sydney Water

Technical Specification for Low Infiltration Sewer Systems – Version 6.0 (2012)
Standard Specification PCS100 – Protective Coating Standard
Standard Specification SS210 – Corrosion Protection and Rehabilitation of Maintenance Holes

(d) Standard Drawings

Drawings

Sydney Water Low infiltration Sewer System drawings are to be used in preference to SEWERAGE CODE OF AUSTRALIA drawings and DPWS Standard Drawings (WSA 02, Part 1).

DESIGN CRITERIA

D12.04 GENERAL

- | | | |
|----|---|-------------------------------------|
| 1. | The design shall be in accordance with the SEWERAGE CODE OF AUSTRALIA, Sydney Water <i>Technical Specification for Low Infiltration Sewer Systems</i> or PWD-SD and PWD-PSD unless specified otherwise herein (WSA 02 Part 1). | Standard |
| 2. | Except where specified otherwise, the division of responsibilities between the Sewer Authority and the Designer shall be in accordance with the SEWERAGE CODE OF AUSTRALIA (WSA 02 Part 1, section 1.2). | Responsibility |
| 3. | The Designer shall confirm the design criteria with the Sewer Authority 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. | Gravity System |
| 4. | Pressurised common effluent or vacuum systems shall only be considered after consultation with the Sewer Authority. | Pressurised or Vacuum System |
| 5. | The Designer shall not provide for common effluent or vacuum discharges to gravity sewers or conventional wastewater treatment plants without the concurrence of the Sewer Authority. | Discharges to Gravity Sewers |

D12.05 DETERMINATION OF AREA TO BE SERVED

- | | | |
|----|--|------------------------------|
| 1. | The area to be served shall be determined in accordance with PWD-SD except that the Sewer Authority may require provision for an upstream sewer. In the design brief the Sewer Authority will indicate the level and size of existing pipe as well as anticipated flows to be allowed for in the design (WSA 02 Part 1, section 2.4.2). Alternatively, the Authority may require the designer to determine the future and ultimate upstream sewer loading and provide adequate allowance for such loadings to the satisfaction of the approving authority. | Upstream Sewer |
| 2. | The depth of sewer shall be sufficient to allow a minimum of 90 per cent of each lot to be serviced. | Depth |
| 3. | All lots shall be able to be served by gravity sewers. Private pump stations delivering to the Sewer Authority mains will not be permitted. | Provision of Sewerage |

D12.06 DESIGN LOADING

- | | | |
|---|--|---------------------------|
| 1. | Design requirements are listed in Annexure D12-B. | Flows |
| The Designer shall obtain the concurrence of the Sewer Authority for the flow to be used for the design of sewers serving industrial areas and developments not specifically listed in the SEWERAGE CODE OF AUSTRALIA or PWD-SD (WSA 02 Part 1, section 3). | | |
| 2. | The design shall take account of AS 2200, AS/NZS 2566.1, AS 3500, AS 3735, the SEWERAGE CODE OF AUSTRALIA and, where design elements are not covered elsewhere in these codes, PWD-SD and PWD-PSD. The approval of preliminary design constitutes a HOLD POINT [see 12.27 (1)]. | Design Codes |
| (HP) | | |
| 3. | The design shall take account of loads on the pipeline from all sources, including superimposed loads from stormwater pipes, water supply mains and other utility services. | Superimposed Loads |

D12.07 SEWER ALIGNMENT (WSAA 02 Part 1, section 5.2)

1. Where it is necessary for sewers to be located outside 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.

Consent of Owner

(WP)

2. 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 02 Part 1, section 5.3).

Road Reserve

3. 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 in the centre of the easement. A Registered Surveyor shall survey easements and pipelines (WSA 02, Part 1, Section 5.2.8).

Easement

4. Where control of the trench width is practical or effective, the design may be based on wide trench condition. The Designer shall call up the need, in the Construction Specification, for the Contractor to supply special construction control with a method statement when there is economic justification to design to narrow trench condition.

Trench Width

5. Sewers shall be laid in a straight horizontal and straight vertical alignment. Curved sewers shall not be provided in the design without the prior written consent of the Sewer Authority (WSA 02, Part 1, sections 5.3.8 & 5.6.7). The gaining of approval for curved sewers constitutes a **HOLD POINT**.

Alignment

(HP)

6. Manufactured bends are permitted adjacent to a maintenance structure for reticulation sewers (WSA 02, Part 1, sections 5.3.8 & 5.6.7).

Manufactured Bends

D12.08 MAINTENANCE HOLES (MHs) (WSA 02 Part 1, section 7)

1. Maintenance holes shall generally be placed on gravity sewers as specified in WSA 02, Part 1, section 7.3, except that

Spacing

- the maximum spacing between any two consecutive maintenance holes shall be 180 m;
- maintenance holes shall be provided at all intersections of reticulation sewers;
- External drop maintenance holes shall be the only form of approved drop structure in accordance with WSA SEW-1303
- maintenance holes shall be provided at all changes in vertical grade;
- maintenance holes shall be provided at all changes in sewer reticulation horizontal direction except where a maintenance shaft or maintenance chamber is permitted to be installed instead;
- maintenance holes shall be provided where required to provide flow gauging stations (WSA 02, Part 1, section 7.10) The flow gauging stations shall comply with the requirements of Sydney Water *Technical Specification for Low Infiltration Sewer Systems*;
- Maintenance holes and flow gauging chambers shall be completely "cast in situ" with water seals (puddle flanges, hydrophilic seals, and the like) placed on all pipe penetrations into the chamber; and

Flow Gauging

Emergency overflow management facilities shall be provided at all sensitive locations and shall comply with the requirements of the Sydney Water *Technical Specification for Low Infiltration Sewer Systems* and the requirements of the NSW Environment Protection Authority (EPA)

- | | | |
|----|--|--|
| 2. | All upstream ends of sewers shall terminate in a maintenance hole if the upstream end is more than 80m from the downstream maintenance hole. | Terminal Maintenance Hole |
| 3. | Step irons shall be provided to all maintenance holes where the depth from top of cover to the invert of the outlet pipe exceeds 900mm. Step Irons shall be of 24mm diameter cast aluminium or plastic encapsulated. | Step Irons |
| 4. | The Designer shall provide for the venting of the sewerage system (WSA 02, Part 1, section 7.5). Maintenance holes which accept pumped discharges shall be vented. | Venting |
| 5. | Connections to existing maintenance holes or sewers of the existing sewerage system are to be based on a sewerage master plan. A master plan is to be developed for each subdivision stage and be approved by the Sewer Authority. | Connections to Existing Systems |
| 6. | Metal access covers shall be manufactured in accordance with AS 3996. | Access Covers |

D12.09 MAINTENANCE SHAFTS (MSs), MAINTENANCE CHAMBERS (MCs) AND TERMINAL MAINTENANCE SHAFTS (TMSs) (WSA 02 Part 7)

1. Maintenance shafts and maintenance chambers may be provided between maintenance holes in accordance with the requirements of WSA 02, Section 7, Table 7.1 to limit the distance between the maintenance hole and another access structure to 80 m;2. The maximum distance between consecutive maintenance shafts shall be 60 m;
3. A maintenance shaft or maintenance chamber may be located at a change of horizontal direction in the sewer main of 5° or below in lieu of a maintenance hole: and
4. A terminal maintenance shafts shall be used where the dead end of a main is greater than 30 m and less than 80 m from the downstream maintenance hole.
5. The maximum depth of a maintenance shaft, maintenance chamber or terminal maintenance shaft shall be 3.0 metres.
6. The maximum loading from high-level connections on a maintenance shaft, maintenance chamber or terminal maintenance shaft shall be 20 EP. Connections shall be limited to the following –
 - One DN 150 sewer and/ one property connection; or
 - Two property connections.

D12.10 PIPELINE (WSA 02 Part 1.4)

- | | | |
|----|--|--|
| 1. | Pipes and fittings for sewerage systems shall be of unplasticised PVC, ductile iron, polyethylene or polypropylene. The material specifications for each pipe type are provided in Clauses D12.13 to D12.19 inclusive. The choice of pipe type constitutes a HOLD POINT . | Type
<div style="border: 1px solid black; padding: 2px; display: inline-block;">(HP)</div> |
| 2. | Asbestos cement pipe and fittings shall not be used. | Asbestos Cement |
| 3. | Concrete pipes, fibre reinforced concrete pipes, steel pipes and vitreous clay pipes shall not be used. | Other Pipes |

4. Pipelines shall be buried. Above ground sewers may be designed in a gravity system only where other options are less practical (WSA 02, Part 1, section 9.8). The Designer shall obtain the concurrence of the Sewer Authority to any proposed above ground sewer. The action to provide for above ground sewers constitutes a **HOLD POINT**.

Buried Pipes

(HP)

5. The Designer shall show on the Drawings the extent of external protection required to be undertaken by the Contractor. External protection shall be shown to comply with the DEVELOPMENT CONSTRUCTION SPECIFICATION - SEWERAGE SYSTEM – Version 1

External Protection

6. Where sewer pipes or rising mains are to be located in close proximity to other services pipes or where there is the likelihood of the pipes not being recognised as sewerage pipes, the Designer shall provide for the pipes to be colour coded and shown on the Drawings accordingly.

Colour Coding

Where sewer pipes or rising mains are to be located in close proximity to or cross other service mains clearances shall be maintained in accordance with WSA 02, Section 4.4.5.2. Sewer pipes shall not be located above water mains without the prior written approval of the Water Authority.

Relativity of Services

Where sewer pipes clearance to stormwater conduits is less than 0.6 metres the sewer shall be constructed in ductile iron cement lined pipe.

7. Piers for any above ground sewer pipeline shall have structural details provided on the drawings.

Piers

8. Property connections shall utilise the buried interface method to the following requirements –

Property Connection

- Where the main is not a deep main and is located within private property or in the verge directly outside private property the property connection may be DN100 and terminate as a dead end.
- In all other cases the property connection shall be DN150 with a rodding point provided at the termination by the use of a 45° junction or a terminal maintenance shaft (TMS).
- The pipeline alignment shall be such that no property connection sewer is to be more than 25 m in length.
- Where longer property connections are required, they shall be designed to the same standards as reticulation sewers and shall be provided with maintenance access. (WSA 02, Part 1, section 6).

9. The Designer shall ensure that the point of property connection to the pipeline shall be not more than 1500mm in depth below the finished surface of the property served, where a connection is deeper a riser must be installed.

Property Connection Depth

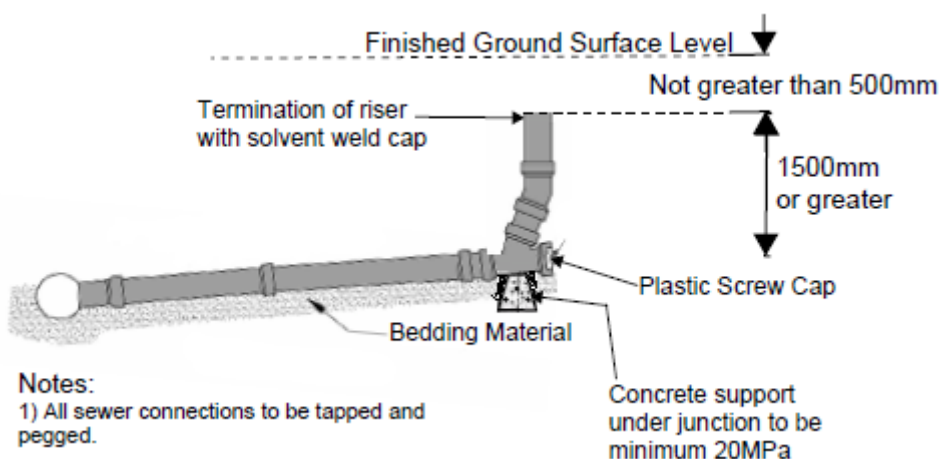


Figure D12.1

- | | |
|---|---------------------------------|
| 10. The Designer shall allow for adequate working area, waste removal and transport arrangements where scouring points or inspection pipe locations are nominated. | Special Allowances |
| 11. The Designer shall design thrust blocks to the requirements of WSA standard drawing WAT-1205. | Thrust Blocks |
| 12. The Designer shall provide for surge control by specifying an appropriate rising main material and class selection. Water hammer analysis shall be carried out for all rising mains. The analysis shall be provided to the Sewer Authority. | Surge Control Method |
| 13. Rising mains shall have a minimum diameter of 100DN. | Rising Main Minimum size |

D12.11 JOINTS

- | | |
|---|--------------------|
| 1. Gravity sewers and rising mains shall generally be spigot and socket joints with rubber rings (elastomeric) complying with AS 1646. | Rubber Ring |
| 2. Flanged joints connecting pipes, fittings, valves and pumps shall comply with AS 2129 (Flanges shall be Table C) or AS 4087, Class 16, as appropriate. | Flanges |
| 3. The concurrence of the Sewer Authority shall be obtained for the type of joint to be used | |

D12.12 MINE SUBSIDENCE AREAS AND AREAS OF SLIPPAGE

- | | |
|---|-----------------------------|
| 1. The Designer shall accommodate the movement associated with the ground strain for the area, as advised by the Mine Subsidence Board for sewerage jointing systems in proclaimed Mine Subsidence Areas, or in a known or expected area of subsidence or slippage. The design ground strain for the development shall be detailed on the Drawings. | Ground Strain |
| 2. The pipe jointing system selected shall be capable of accepting ground movements, without impairing the water tightness of the joint, for the ground strain as advised by the Mine Subsidence Board. For areas with high ground strains a pipe jointing system using shorter effective length pipes and/or deep socket fittings shall be used. This action constitutes a WITNESS POINT . The Principal shall advise at the time of notification by the Designer whether the option to confer is required. | Pipe Jointing System |
| 3. Where the Mines Subsidence Board does not cover an area of known, or suspected, subsidence or slippage, the above requirements shall still apply. | Areas Applicable |

(WP)

MATERIALS

D12.13 UNPLASTICISED PVC (uPVC) GRAVITY PIPE

1. Unplasticized PVC (PVC-U) pipe shall be specified for sewer gravity mains of 150 mm and 225 mm diameter and shall be manufactured in accordance with AS/NZS 1260, designed in accordance with AS/NZS 2566.1 and with elastomeric seal spigot and socket joints (WSA 02, Part 1, Section 4.6). The pipe shall be not less than Class SN 8.
2. Where PVC pipe is used in conjunction with DI fittings, the Designer shall ensure the jointing system is appropriate.
3. Fittings for use with PVC pipe shall be elastomeric seal jointed.

Standard**Ductile Iron
Pipe
Compatibility****Fittings****D12.14 UNPLASTICISED (uPVC) AND MODIFIED PVC (PVC-M) PRESSURE PIPE**

1. Rubber ring joint uPVC (min. Class 12) pressure pipe may only be used for sewer rising mains of 80mm diameter or less.
2. PVC-M pipe (min. PN 12) may be used for pressure rising mains. And shall comply with AS/NZS 4765 and shall be of the class and size shown on the Drawings

Not Permitted**Standard****D12.15 DUCTILE IRON (DI) PIPE AND FITTINGS**

1. Ductile iron pipes and fittings shall be specified for all sewer rising mains and are to be manufactured and cement mortar lined in accordance with AS/NZS 2280 minimum and shall specify PN35 Flanged Class (WSA 02, Part 1, Section 4.5).
2. The Designer shall specify cement mortar lining in accordance with AS 1281, or fusion-bonded medium density polyethylene to AS/NZS 4321. External protection shall be epoxy coating to AS 3862 where not otherwise specified as sleeved or wrapped, taking into account the type of corrosion protection required.
3. Generally, pipe and fitting joints shall be specified to be spigot and socket type using a rubber ring (elastomeric) push in seal made of natural rubber or ethylene propylene rubber with compounds complying with AS 1646. The seal shall be a single jointing component shaped to provide both groove lock and seal mechanisms.
4. Flanges shall be specified to be manufactured in accordance with AS 2129 Table C. Bolts and nuts for flanged joints shall be in accordance with AS 2129 and galvanised in accordance with AS 1214 or stainless steel in accordance with AS 2837 as for pumps specified in the specification DEVELOPMENT CONSTRUCTION SPECIFICATION – SEWERAGE SYSTEM – Version 1.

Standard**Corrosion
Protection****Joints****Flanges****D12.16 VITRIFIED CLAY (VC) PIPES AND FITTINGS**

1. Vitrified Clay (VC) pipes and fittings shall not be used

Not Permitted**D12.17 STEEL PIPE AND FITTINGS**

1. Steel pipes and fittings shall not be used.

Not Permitted

D12.18 POLYPROPYLENE PIPE AND FITTINGS

1. (a) ~~Twin walled, corrugated~~ polypropylene pipes and fittings may be used for sewer gravity trunk mains 225 mm or greater in diameter and shall be manufactured to comply with AS/NZS 5065 and designed to AS/NZS 2566.1 . (WSA 02, Part 1, Section 4.8).

PP Standard

(b) Polyethylene pipes shall not be used, except as product for the trenchless rehabilitation of appropriate sewer main with prior Council approval. .

PE Pipe usage**D12.19 GLASS REINFORCED PLASTIC (GRP) PIPE AND FITTINGS**

1. Glass filament reinforced thermosetting plastic (GRP) pipes may be used for gravity sewer mains and pressure mains..

Standard

2. Glass filament reinforced thermosetting plastics (GRP) pipes shall comply with AS 3571 and shall be of the class and size shown on the Drawings and installed in accordance with AS/NZS 2566.1 (WSA 02 Part 1, section 4.9).

Standard**PUMP STATIONS****D12.20 GENERAL**

1. The design of sewerage pumping stations and ancillary equipment shall be subject to endorsement by the Sewer Authority. This action constitutes a **HOLD POINT** The Designer shall take into account access, site maintenance and restoration, easement, power supply and working area when locating pump stations in road reserves or on private property..

Location**(HP)**

2. Where not provided as a Vacuum Sewerage System, the Designer shall provide for all pump stations to be of the single wet well submersible pump style with self contained freestanding switchboards suitable for external use. Pump Stations shall be designed in accordance with PWD – PSD. The Designer shall provide for the construction of the pump well after taking into consideration the ground and site conditions.

Type

3. Cast in situ concrete fabrication shall

**In Situ
Fabrication**

- (a) Use Sulphate resistant or low heat (LH) (special class) concrete.
- (b) Have all internal surfaces epoxy lined to current edition of Sydney Water's *Protective Coating Standard*. The colour can range from "off-white" to "light grey".
- (c) Have all pipe and equipment penetrations tested for water tightness.
- (d) Have water seals (puddle flanges, hydrophilic seals, and the like)20 placed on all pipe and equipment penetrations.

4. Preformed components or systems, complying with the Drawings, if any, may be used in lieu of in-situ construction provided:

**Preformed
Components**

- (a) The proposed precast pump station make and model are approved by the Sewer Authority for use prior to its incorporation in the sewerage system design.
- (b) Preformed concrete wall units are to be manufactured to AS 4058. The Designer shall take into account the cover requirements for reinforcing steel and cement types

- (c) Precast segments shall be joined using the manufacturer’s recommended practice and internal surfaces patched to form a continuous flush surface.
- (d) The Designer shall ensure selected components make a watertight system. Water seals (puddle flanges, hydrophilic seals, and the like) shall be placed on all pipe and equipment penetrations
- (e) All pipe and equipment penetrations shall be fabricated and tested in the factory for water tightness.

5. Where the pump station site is exposed to possible flooding, the Designer shall provide for the top of pump well to be one (1) metre above the 1 in 100 year flood level or to such other level as provided by Council’s planning instruments, whichever is the higher.

Protection Against Flooding

6. The Designer shall provide for the design of pump wells against flotation both during the construction/installation stage and whilst operating under flood conditions designed as above.

Protection Against Flotation

7. Package pump station units may be designed, with the prior concurrence of the Sewer Authority, where the area being serviced is small and/or their inclusion contributes to an overall lesser depth of excavation in the system.

Package Units

8. The Designer shall provide for internal surfaces of wet wells to be prepared and coated with an epoxy paint system approved by the Superintendent. The colour shall range from “off white” to “light grey”. All bolted connections within wet wells shall be stainless steel complying with AS 1449 grade 316.

Surfaces

9. The Designer shall size pipes and pump station capacity to avoid surcharges under design flow conditions. The Designer shall provide emergency storage for overflows in strict accordance with the conditions of the licence, or at a minimum the Average Dry Weather Flow (ADWF) of 8 hrs.

Overflows

10. The Designer shall provide for alarms and signals systems with the concurrence of the Sewer Authority.

Alarms and Signals

D12.21 PUMP

1. The Designer shall specify special requirements, if any, for materials to be used in the pump station, taking into consideration the nature and composition of the sewage to be pumped. Each pump shall be fitted with a flushing valve installed in accordance with the manufacturer’s recommendations.

Special Requirements

2. The Designer shall provide for pump stations to be fitted with suitably sized pumps, consistent with other pumps in service, in conventional duty pump/standby pump arrangement.

Size

3. Each pump shall be capable of passing solids of not less than 75mm diameter unless grinding equipment is incorporated

Impeller Clearance

4. Each pump shall be capable of being removed with the aid of fixed guide rails.

Removal

5. Pump sets are to be interchangeable within each pump station. Pumps are to be consistent with other pumps in use by the Sewer Authority. The Sewer Authority will specify the brand and type of pumps to be used.

Inter-changeable

6. The Designer shall design structural steelwork in accordance with HB 48.

Structural Steelwork

D12.22 ELECTRICAL

- | | | |
|----|---|--|
| 1. | Notwithstanding other clauses mentioned herein, the Designer shall be responsible for the design of the equipment as suitable for the purpose. Equipment design shall comply with the requirements of the relevant standard specification. | <i>Design Responsibility</i> |
| 2. | The Designer shall provide for Switchgear Control Assembly (SCA), SCA housing and electrical requirements as detailed in the DEVELOPMENT CONSTRUCTION SPECIFICATION- SEWERAGE SYSTEM – VERSION 1. | <i>SCA and Electrical</i> |
| 3. | Where more than one (1) item of equipment is designed to form a particular function, all such items of equipment shall be identical and completely interchangeable (eg pilot lights, pushbuttons, relays, etc). | <i>Inter-changeability</i> |
| 4. | The switchboard shall be installed visibly and physically accessible above areas at risk of flooding. | <i>Switchboard</i> |
| 5. | Ambient conditions shall be within the normally accepted limits of -10°C to +45°C. | <i>Ambient Conditions</i> |
| 6. | The switchboard shall be connected to the local electricity supply system.

Nominal system parameters:

(a) 415 volt, 3-phase, 4-wire, 50 Hz, solidly earthed neutral system.

(b) Prospective Fault Current: As specified by the Local Supply Authority.

The switchboard shall provide a generator connection point to allow the pump station to be run via generator in the event of failure of the local electricity supply system. | <i>Connection to Local Supply</i> |
| 7. | The works shall be designed in accordance with and subject to the provisions of MEW E101, except where modified by this Specification. | <i>Standards</i> |
| 8. | The pump station shall be designed for fully automatic operation in the unmanned condition. | <i>Automatic Operation</i> |

D12.23 WATER SUPPLY

- | | | |
|----|--|--|
| 1. | The Designer shall provide for automatic well washers and flush valves to be installed at each pump station and controlled so that they operate when the duty pump is operating. | <i>Cleaning</i> |
| 2. | The Designer shall provide at all pump stations for an adequate water supply for cleaning purposes. This supply shall be protected from contamination due to backflow by the installation of a registered break tank or reduced pressure zone device in accordance with AS 3500. | <i>Contamination Protection</i> |

D12.24 LADDERS

- | | | |
|----|--|-------------------------------|
| 1. | Ladders shall comply with AS 1657 and applicable Work Health and Safety legislation (WSA 02 Part 1, section 7.6.9). | <i>Standard</i> |
| 2. | If required, the Designer shall set intermediate landings in wells to achieve the minimum head room clearance. Wherever possible, the landing shall be located adjacent to fittings and machinery requiring maintenance. | <i>Ladder Landings</i> |
| 3. | Ladder cages shall not be used on ladders in pump station wet wells. | <i>Ladder Cages</i> |

D12.25 TELEMETRY

1. The Designer shall provide for telemetry requirements in accordance with the schedule supplied by the Sewer Authority. **Schedule**

2. The telemetry system is to be compatible with the existing system in use. **Compatibility**

D12.26 OTHER APPURTENANCES

1. The Designer shall provide for venting and odour control of each pump station, rising main, receiving maintenance holes, and gravity sewers, after consultation with the Sewer Authority. **Venting and Odour Control**

2. The Designer shall provide for machinery lifting equipment including pump chains. **Lifting Equipment**

3. The Designer shall provide pressure tapping and gauges for all valves, including isolation and non-return valves and as detailed in the DEVELOPMENT CONSTRUCTION SPECIFICATION-SEWERAGE SYSTEM – VERSION 1. **Gauges**

4. The Designer shall take account of the possibility of site flooding ingress and overflow, and Occupational Health and Safety requirements in providing for access and inspection covers. **Covers**

DOCUMENTATION

D12.27 SEWERAGE SYSTEM

1. The Principal shall submit, to the Sewer Authority an Application for Certification of Design Drawings under Part 3 Division 2 Section 307 of the Water Management Act 2000, together with four (4) copies of the proposed sewerage system design, including calculations, and obtain approval prior to commencement of construction (WSA 02 Part 1, section 9). This action constitutes a **HOLD POINT**. Approval of the design by the Sewer Authority will be made by the issue of a compliance certificate under Part 3 Division 2 Section 307 of the Water Management Act 2000. **Review**

(HP)

2. The Drawings shall show to scale:

(a) Plan showing:

Plan

- (1) Lot boundaries and lot numbers
- (2) Location and chainage of all maintenance holes, junctions and dead ends
- (3) Maintenance hole types
- (4) Location and size of all gravity and rising mains and pump stations
- (5) Location of vents
- (6) Sewer main number and maintenance hole number
- (7) Existing sewer mains, junctions and maintenance holes
- (8) For level lots, spot levels at the lot extremities to show that at least 90 per cent of the area of the lot can be connected to the sewer by gravity.
- (9) Hatching shall show the area of any lot not serviced.

- (10) Site contours
 - (11) Existing and proposed features and services
 - (12) North point and scale bar
 - (13) Easement location
 - (14) Arrangement of other utilities.
- (b) Longitudinal section showing: ***Longitudinal Section***
- (1) Reduced levels for natural surface and design surfaces at all changes in grade
 - (2) Maintenance hole locations and type
 - (3) Maintenance holes numbered in accordance with the Sewer Authority's Asset Register
 - (4) Invert levels for maintenance holes, maintenance shafts and maintenance chambers inlet and outlet
 - (5) Size, type, class and grade of pipe
 - (6) Location, invert level and size of all drainage lines, water mains, and other utility services crossing the main
 - (7) Notation regarding all joining lines
 - (8) Property ownership
 - (9) Note upstream ET's at each maintenance hole
 - (10) Note "In road" trench conditions
 - (11) Locations and levels of other services (existing or proposed) relative to the sewer main
- (c) General arrangement of pump stations with site plan; concrete outlines; number, make, model and details of pumps; inlet and outlet pipework details and levels; pump cut in; cut out and alarm levels; switchboard location; pump station access details; design starts per hour. ***Pump Stations***
- (d) Details of corrosion protection required for pipes and fittings. ***Pipe Protection***
- (e) Areas designated for trenchless pipe installation. ***Trenchless Installation***
3. Detail plans shall be drawn to a scale of 1:500 and longitudinal sections to a horizontal scale of 1:500 and a vertical scale of 1:100. ***Drawing Scale***
4. Drawings shall be "A1" size for approval with "A3" size copies to be forwarded to the Sewer Authority once the plans have been approved. ***Drawing Size***
5. Drawings shall be provided also in electronic form after consultation with the Sewer Authority. ***Electronic Form***

D12.28 PUMP STATION

1. The Principal shall submit, to the Sewer Authority and obtain approval, prior to commencement of the manufacture of any pumps and control equipment, four (4) copies of the following: ***Review***

- a. **Switch and Control Gear Assemblies** - Proposed fully dimensioned manufacturing details, general arrangement (showing internal/external details) and foundation/gland plate details.
- b. Common Control - Complete circuit diagram and description of operation.
- c. Schedule of Equipment - Completed as to the equipment to be provided.
- d. Other Engineering drawings as required to fully describe the proposed equipment.

The submission of the documents constitutes a **HOLD POINT**.

(HP)

2. The Designer shall take into consideration the technical requirements to minimise all risks associated with entry into confined space.

Risk

3. Drawings shall be on "A1" size with "A3" size copies to be forwarded to the Sewer Authority once the plans have been approved. All symbols used shall conform to AS 1102 and all wires and terminals shall be numbered.

Drawing Size

4. Drawings shall also be provided in electronic form after consultation with the Sewer Authority.

Electronic Form

D12.29 ASSET REGISTER

1. The Designer shall provide asset schedules and Drawings in a form consistent with the existing or proposed Asset Register after consultation with the Sewer Authority. (WSA 02 Part 1, section 10.5).

Consistency

SPECIAL REQUIREMENTS

D12.30 WORK AS EXECUTED (WAE) PLANS

WAE

1. Full WAE plans for all constructed infrastructure shall be submitted to Council prior to the issue of a Subdivision Certification and/or an Occupation Certificate. The submission of these documents constitutes a HOLD POINT.

(HP)

2. Plans shall be submitted in electronic format in accordance with Council's Handbook of Drafting Standards.

D12.31 RESERVED

ANNEXURE D12- A

STANDARD DRAWINGS

The following Sydney Water standard drawings, as amended by the Sewer Authority (Queanbeyan City Council (QCC)), are deemed to comply for the purposes of this specification. Reference to Sydney Water on the drawings is deemed to be a reference to the Sewer Authority (QCC).

DRAWING	TITLE	QCC AMENDMENT / COMMENT
Figure LIS-1	Low Infiltration Sewer System – Pipe Connection to Maintenance Hole – PVC-u Sewers	
Figure LIS-2	Low Infiltration Sewer System – Pipe Connection to Maintenance Hole – PP and GRP Sewers	
Figure LIS-3	Low Infiltration Sewer System – Cover Arrangement for Maintenance Hole	
Figure LIS-4	Low Infiltration Sewer System – External Drop at Maintenance Hole	
Figure LIS-5	Low Infiltration Sewer System – DN100 PVC-u Property Connection Sewers – Shallow Connections	Inspection shaft not used by QCC
Figure LIS-6	Low Infiltration Sewer System – DN100 PVC-u Property Connection Sewers – Deep Connections	Inspection shaft not used by QCC
Figure LIS-7	Low Infiltration Sewer System – Flow Gauging Maintenance Hole	
Figure LIS-8	Low Infiltration Sewer System – Overflow Relief Gully	
Figure LIS-9	Low Infiltration Sewer System – DN100 PVC-u Property Connection Sewers – Alternative Shallow Connections	Inspection shaft not used by QCC
Figure LIS-10	Low Infiltration Sewer System – DN100 PVC-u Property Connection Sewers – Alternative Deep Connections	Inspection shaft not used by QCC

Where there is discrepancy between the adopted Sydney Water drawings listed above and any WSA drawing, the Sydney Water drawings take precedence.

SEWERAGE SYSTEM – QUEANBEYAN PALERANG

The following Water Services Association of Australia standard drawings, as amended by Queanbeyan City Council (QCC), are deemed to comply for the purposes of this specification where their detail is not provided (or does not conflict) with detail shown in the above Sydney Water Drawings:

Sewerage Code of Australia, Part 4: Standard Drawings (WSA 02 – 2002) (Second Edition, Version 2.3)

DRAWING NUMBER	ACTIVITY	TITLE	QCC AMENDMENT / COMMENT
PIPELINE LAYOUT			
SEW-1100	Design Layouts	Typical Locality & Site Plan	A typical list of symbols shall be forwarded to QCC for concurrence prior to use on drawings. Sewer mains and structures shall be drawn in red – continuous line for proposed work and hatched for existing lines.
SEW-1101	Design Layouts	Longitudinal Sections	
SEW-1102	Design Layouts	Connection to Existing Sewer Schedule of Works	
SEW-1103	Pipelaying	Typical Arrangements	
SEW-1104	Property Connection Details	Sewer in Road Reserve	IO Method not used by QCC Property connection to be provided with connection at 45° and an access point. Connection point to be 1.0 m inside property boundary.
SEW-1105	Property Connection Details	Sewer in Easements & Inside Property	IO Method not used by QCC Property connection to be provided with connection at 45° and typically located 1.0 – 2.0m from side property boundary on low side of lot.
SEW-1106	Property Connection Details	IO Interface Method	Not used by QCC
SEW-1107	Property Connection Details	Buried Interface Method	Note 5 - Maintenance access (rodding point) to be provided.
SEW-1108	Property Connection Details	“Y” Branch & Around Obstructions	“Y” Branch only to be used with prior concurrence of QCC. IO Method not used by QCC Note 5 – Maintenance access (rodding point) to be provided.
SEW-1109	Property Connection Details	Private Property & Marking Systems	Marking Tape System to be used with a Junction Peg tied to the marking tape at the surface

SEWERAGE SYSTEM – QUEANBEYAN PALERANG

DRAWING NUMBER	ACTIVITY	TITLE	QCC AMENDMENT / COMMENT
EMBEDMENT / TRENCHFILL AND SUPPORT SYSTEMS			
SEW-1200	Soil Classification Guidelines	Allowable Bearing Pressures for Bulkheads	
SEW-1201	Embedment and Trenchfill	Typical Arrangements	
SEW-1202	Standard Embedment	Flexible & Rigid Pipes	
SEW-1203	Special Embedment	Inadequate Foundations Requiring Over Excavation & Replacement	
SEW-1204	Special Embedment	Support Utilising Piles	
SEW-1205	Special Embedment	Concrete & Stabilised Supports	
SEW-1206	Trench Drainage	Bulkheads & Trenchstop	
SEW-1207	Trench Drainage	Typical Systems	
SEW-1208	Verticals & Near Verticals	Exposed & Concealed Methods	Note 5 – IO cover & frame as per SEW-1317
ACCESS STRUCTURES			
SEW-1300	Maintenance Holes	Sewers <= DN300 Precast Types P1& P2	Not to be used.
SEW-1301	Maintenance Holes	Sewers <= DN300 Cast Insitu Types C1 & C2	
SEW-1302	Maintenance Holes	Pipe Connection Details	
SEW-1303	Maintenance Holes	Sewers <= DN300 Changes in Level Details	
SEW-1304	Maintenance Holes	Sewers <= DN300 Typical Channel Arrangements	
SEW-1305	Maintenance Holes	Typical Channel Details	
SEW-1306	Maintenance Holes	Alternative Drop Connections	Alternative Drop connections are subject to prior concurrence to their use by QCC Typical Internal Drop and Typical Drop Chamber shall only be considered in rock or similar where a standard external drop cannot be constructed. Post Construction Installation Detail shall only be considered on developed sites.
SEW-1307	Maintenance Holes	Step Irons & Ladders	Monorail Ladder not used by QCC.
SEW-1308	Maintenance Holes	Typical MH Cover Arrangements	
SEW-1309	Maintenance Holes	Sewers DN 375 to DN 750	
SEW-1310	Maintenance Holes	Permanent Formwork >= DN 375	
SEW-1311	Maintenance Holes	Depth to Invert 6 m to 15 m	
SEW-1312	Maintenance Holes	Depth to Invert > 15 m	

SEWERAGE SYSTEM – QUEANBEYAN PALERANG

DRAWING NUMBER	ACTIVITY	TITLE	QCC AMENDMENT / COMMENT
SEW-1313	Maintenance Holes	MH Connection Details DN 110 to DN 450 PE Pipe	
SEW-1314	Maintenance Shafts	Typical Installation	
SEW-1315	Maintenance Shafts	MS & Variable Bend Installations	
SEW-1316	Maintenance Shafts	TMS and Connection Installations	
SEW-1317	Maintenance Shafts	Typical MS Cover Arrangements	Wooden bearers shall not be used for any Non-Trafficable Cover additional support system.
Special Crossings / Structures Arrangements			
SEW-1400	Buried Crossings	Syphon Arrangement	Note 10 - Silt trap not required
SEW-1401	Buried Crossings	Railways	
SEW-1402	Buried Crossings	Major Roadways	
SEW-1403	Buried Crossings	Bored & Jacked Encasing Pipe Details	
SEW-1404	Aerial Crossings	Aqueduct	
SEW-1405	Aerial Crossings	Aqueduct Protection Grille	
SEW-1406	Aerial Crossings	Bridge Crossing Concepts	
SEW-1407	Ventilation Systems	Induct Vent	QCC concurrence to proposed vent detail design required
SEW-1408	Ventilation Systems	Educt Vent	QCC concurrence to proposed vent detail design required
SEW-1409	Water Seal Arrangements	Mains Type	
SEW-1410	Water Seal Arrangements	Maintenance Hole System	
SEW-1411	Water Seal Arrangements	Twin Maintenance Hole System	
SEW-1412	Emergency Relief Structure	Typical Arrangement DN 150 to DN 375	
Connections to Existing Systems			
SEW-1500	Insertion & Repair Systems	Cut-in Methods	Note 5 – QCC concurrence required prior to use of a single repair clamp.
SEW-1501	Insertion & Repair Systems	Insertion of Junctions	PVC Saddle permissible in vertical position subject to minimum fall being available in the lot external drainage line, otherwise Junction or SS Sewer Junction required.
SEW-1502	Insertion & Repair Systems	Maintenance Structures	

ANNEXURE D12-B

SEWER DESIGN REQUIREMENTS

STANDARD SEWERAGE SYSTEMS – BROWNFIELD DEVELOPMENT

The Sewer Authority will provide a base design flow to the applicant for design and modelling purposes. This design flow will be based on network performance monitoring within the catchment and shall be subject to the land use type, density and catchment characteristics. If no design flow can be determined then a minimum flow leaving a property of 180L/EP/D shall be used before it enters into a Council sewer. Calculations shall be based on the methods set out in this document, unless otherwise agreed with QCC.

Note: Base design flows shall be adjusted where additional inflow sources (change in sewer catchment characteristics) into the collection network such as swimming pools, or other point sources are present.

REDUCED INFILTRATION SEWERAGE SYSTEMS - GREENFIELD DEVELOPMENT

The Sewer Authority requires Greenfield Development sites to be provided with a Reduced Infiltration Sewerage System (RISS) because these systems significantly reduce infiltration and inflow and thereby mitigate exposure to significant regulatory and legal risk.

The following design criteria apply for Greenfield Development sites –

Criteria	Value	Units
Flow leaving property boundary before it enters into a Council sewer.	180	L/EP/D
Note: Base design flows shall be adjusted where additional inflow sources (change in sewer catchment characteristics) into the collection network such as swimming pools, or other point sources are present		
GWI: Approximate proportion of GWI in ADWF i) Note: While some areas have water tables lower than sewer levels, QCC experience indicates that water tables remain elevated for long periods after storm events, hence an allowance for GWI at all times is appropriate	10	%
Design Average Dry Weather Flow (ADWF plus GWI)	200 (rounded up from 198)	L/EP/D
Peaking factor "d" (PDWF / ADWF) as per Fig B.1 and formula in Appendix B, WSA 02 - 2002 - 2.3 IIF (wet weather infiltration inflow). Infiltration inflow component to be calculated and modelled in accordance with Sydney Water, <i>Technical Specification for Low Infiltration Sewer Systems</i> . Designs storms and intensities shall be obtained from Council's <i>Handbook of Drainage Design Criteria – Queanbeyan</i> .		
ii) Percentage ingress of storm runoff from the design storm. It is anticipated that the IIF will gradually increase over time (approximately 15 to 20 years) to about 3%.	3.0	%
iii) Design storm ARI See Council's <i>Handbook of Drainage Design Criteria – Queanbeyan</i> . and Australian Rainfall and Runoff, (ARR), for design storm parameters for the Queanbeyan region. Infiltration / inflow from the design storm must be contained within the sewer pipe. Systems analyses should be for a worst case scenario in terms of peak flow and volume.	1:10	years
iv) Storm runoff to be calculated in accordance with ARR - See Section 3.2 below for an outline of the design methodology		
Maximum calculated overflow (to environment) frequency at any critical point in the sewerage collection network	1:25	years
Where possible, manholes should be positioned such that the top of the manhole ring is above the 1:20 year ARI flood event.		
Manholes in flood prone areas below the 1:10 year ARI shall be bolted down. Manhole lids shall be gas and water tight to prevent water ingress. QCC may at its own discretion change this requirement, subject to the outcomes of site specific risk assessments and after evaluation of presented results. (See Section 3.3)		
Minimum peak dry weather flow (PDWF) velocity	0.70	m/s
Maximum depth ratio at peak dry weather flow (PDWF)	≤ 0.50	Dia
Maximum depth ratio at peak wet weather flow (PDWF+GWI+IIF)	≤ 0.95	Dia
Maximum velocity in all sewers	2.0	m/s
Colebrook White roughness coefficient for gravity sewers	0.30	mm

Colebrook White roughness coefficient for pump pressure mains		
I)	Plastic, glass reinforced, and epoxy lined ductile iron pipes	0.30 mm
II)	Unlined or cement lined ductile iron pipes	0.60 mm
Minimum and maximum grades and pipe deflection shall be in accordance with manufacturers' recommendations and within the Sewerage Code of Australia <i>Planning and Design</i> guidelines.		
Diameters of personnel entry points shall be agreed with QCC. The primary reason is to provide sufficient ingress and egress during maintenance and recovery operations.		
Overflow relief gullies (ORGs) shall be leak proof (anti infiltration), allowing surcharge relief. Maintenance of the water seal shall not be achieved by water from a tap located over the gully.		
LEAK TIGHT SEWERAGE SYSTEMS		
QCC may consider a Leak Tight sewerage system under certain conditions.		

Analysis and Design Methodology

The analysis of sewage collection networks should be similar to a storm drainage methodology than a conventional sewerage methodology. The approach, routes flows (ranging from steady state, inflow hydrographs to unsteady ((dynamic)) modelling for pressurised systems) through a pipe network to determine flow characteristics in the pipes and the range of inflows or inflow hydrograph to the sewage treatment plant or pump station. In summary the LISS methodology includes:

- (1) For each node in the network for NEW and OLD systems (as per endorsed design life):
 - (i) Calculate average dry weather flow (ADWF) and peak dry weather flow (PDWF) using the algorithms in WSA 02
 - (i) Calculate a dry weather Ground Water Infiltration (GWI) allowance
 - (ii) Calculate the amount of wet weather infiltration / inflow (IIF) entering the sewerage system from the design storm based on a 1:10 year ARI design storm (see Australian Rainfall and Runoff). Design shall consider the most critical events in terms of peak flow and volume. The design shall consider the following scenarios:
 - a. Drought periods;
 - b. Periods with average rainfall;
 - c. Prolonged periods with above average rainfall; and
 - d. Climate change.

QCC shall endorse selected design ARIs and design assumptions.

- (2) Rout the design flow, QD (PDWF plus GWI and IIF), at each node through the pipe network to determine the flow characteristics for each pipe length between nodes. A spread-sheet based steady state and unsteady state analysis can be used to calculate flow characteristics in pipes at PDWF and QD.
- (3) Adjust the internal pipe diameters and grades for the proposed new sewage collection system until flow conditions in all pipes comply with the specified design criteria.
- (4) Estimate the overflow conditions (frequency, total volume of overflow, duration of the overflow) at critical points in the sewage collection system (i.e, pump stations, treatment plant inlets, near water courses or water bodies, schools, hospitals, aged care facilities, etc) for:
 - (i) The proposed new system; in terms of compliance with the specified overflow design frequency.
 - (ii) The downstream existing networks; in terms of inflows maintaining or improving pre-existing overflow conditions in the existing system.
- (5) In order to prepare an overflow management plan, QCC will need to know both the return period (probability) of an overflow event and the size of the storm that gave rise to it. Two approaches could be used as follows:
 - (i) Increasing the design storm ARI (duration and intensity of storms) until overflow occurs in the overall system at critical points.
 - (ii) Using statistical methods, create a time series of runoff events to estimate the return period (probability) of an overflow occurring in the overall system at critical points.
- (6) Determine appropriate adjustments to the sewage collection system to meet the required sewage overflow design criteria:
 - (i) In the proposed new collection network this could include (but not limited to):
 - a. Increasing proposed pipe diameters and grade; and
 - b. Providing emergency attenuation storage.

This is to ensure that the overflow frequency at any point in the new system meets the specified criteria.
 - (ii) In the downstream existing receiving network this could include (but not limited to):
 - a. Augmentation of the existing network; and
 - b. Providing emergency attenuation storage.

This is to ensure that the overflow frequency in the downstream existing network does not exceed pre-existing conditions.

- (7) Provide properly designed overflow retention and primary treatment facilities at identified overflow points to facilitate actions under the QCC Sewerage Recovery Plan as follows:
 - (i) At critical points in the proposed new sewage collection network.
 - (ii) At critical points in the existing downstream system where inflows from the proposed new system exacerbate overflow conditions.
- (8) As the hydraulic analysis will need to cover pipe flow conditions ranging from open channel to pressure flow, and may require dynamic extended period as well as steady state analysis, computer software may need to be used, particularly for estimating overflow conditions.

Presentation of Results

The proponent (and/or design consultant) shall present the system analyses in a report, including at least (but not limited to) the following information:

- (1) Brief summary overview of the project including background, overall scope sewer catchment characteristics (size, layout, etc.), staging, scenarios modelled, modelling outcomes, etc.
- (2) Population, EP, and flow projections by year and land use / development type including; household size for each dwelling type, unit per EP flow rates, schedule of lot sizes, etc to enable QCC to understand flow build up in the system.
- (3) Staging of infrastructure.
- (4) Summary of key modelling assumptions used including any analyses under ARR to determine wet weather infiltration inflow and sewage overflow conditions.
- (5) Input data to the model either in native format (if software such as SWMM is used) or Excel Spread Sheet including a schematic (node and pipe numbering) of the network model.
- (6) Output data from the model either in native format (if software such as SWMM is used) or Excel Spread Sheet.
- (7) Sketches and maps showing the layout of the complete proposed new sewage collection system including a clear indication of system staging.
- (8) Sketches and maps showing any proposed augmentations to the downstream existing system required to maintain or improve pre-existing sewage overflow conditions.
- (9) Sketches and maps showing provision for overflow management facilities at critical points where necessary.
- (10) Sketches and maps showing proposed locations of sewer flow gauging chambers including recommended gauging and remote monitoring equipment.
- (11) Sketches and maps indicating flood lines and levels including output data tables from modelling software.
- (12) Geotechnical report describing findings of geotechnical results such as (but not limited to):
 - a. Excavatability of soil;
 - b. Soil profile and classification;
 - c. Whether ground water or moist conditions was encountered; and
 - d. Permeability of native soil.