

Engineering Guidelines for Subdivisions and Development Standards

PART 5 SEWER RETICULATION DESIGN

JULY 2020

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1. INTRODUCTION

This Part of Council's 'Engineering Guidelines for Subdivisions and Developments' is related to sewerage reticulation.

The design and construction of sewerage reticulation shall generally be in accordance with the latest version of the Water Services Association of Australia (WSAA) 'Sewerage Code of Australia (WSA02)'. References to WSA codes are to the WSA code which was current at time of publication of this guideline if the WSA standard is updated refer to the equivalent clause

However this part of Council's 'Engineering Guidelines' takes precedence over the WSAA Standards. (i.e. these are Council's requirements which may be different to WSA02).

The other Parts of the Engineering Guidelines for Subdivisions and Development are as follows:

Part 1 General Requirement

Part 2 Design of Roads

Part 3 Stormwater Drainage Design

Part 4 Water Reticulation Design

Part 5 Sewerage Reticulation Design

Part 6 Landscaping, and Measures for Erosion, Sedimentation and Pollution Control

Part 7 Testing

This part of the 'Engineering Guidelines' is set out in the same order as WSA02 for ease of cross-referencing.

2. REFERENCE DOCUMENTS

The format of the guidelines has been simplified by making reference to both National and State Standards where applicable. Where these standards vary from the referenced standards the variations are highlighted and cross-referenced. The current version of the referenced standard will apply. The references below were current at time of publication of this standard. If any of the references are updated refer to the equivalent clause in the updated versions. These guidelines shall take preference over the referenced standards. In addition to the criteria outlined in this manual, any relevant acts, regulations and Australian Standards will apply.

In New South Wales, RMS referenced standards will apply:

- Conveyancing Act 1919 No 6
- Gravity Sewerage Code of Australia WSA02 – 2014 Version 3.1
- Sewerage Pumping Code of Australia WSA04 – 2005 Version 2.1
- WSA 07-2007 Pressure Sewerage Code of Australia Version 1.1

Abbreviations

MGA	Map Grid of Australia
PWWF	Peak Wet Weather Flow
SPS	Sewage Pumping Stations
W.A.E.	Works as Executed
WSAA	Water Services Association of Australia

3. GENERAL

3.1 SCOPE (REFER WSA SECTION 1)

Council (as the Water Authority) will not provide a 'Concept Plan' for the localised sewer network. This is the responsibility of the 'Designer' and particularly so if the proposed development is going to be staged (i.e. developed in stages). Refer to Clause 1.2.7.1 of WSA02.

If such a staged development is proposed the 'Designer' shall provide an indicative overall concept plan of the development at the time of submitting the first stage to Council for approval. This concept plan shall not be binding with respect to the proposed layout/staging; however, the final number of tenements cannot differ by more than 20% between the original concept plan and the ultimate constructed development.

All development in bush fire prone areas is to comply with the RFS NSW planning for bushfire protection.

The design of sewage pumping stations (SPSs) is addressed in WSA 04 2001 Sewage Pumping Station Code of Australia. The Authority has an objective of minimising the number of pump stations to reduce ongoing maintenance costs and liabilities. Pump station and rising main design shall be in accordance with the Authority Standards. These standards encourage a consistent approach to telemetry, electrical, pumps and maintenance issues throughout the system.

4. FLOW ESTIMATION (REFER WSA02-3)

4.1 DESIGN FLOW ESTIMATION METHOD (REFER WSA02-3.3)

Flow estimation assumptions shall be given in the concept plan.

4.1.1 TRADITIONAL DESIGN FLOW ESTIMATION METHOD (REFER WSA02-3.3.2)

The method for determination the design flow shall be in accordance with the methodology specified by WSA02-3.3.2 with the following amendment:

The contribution to EP should be taken as 3.1 per single occupancy lot i.e. a single residence or dwelling.

5. DETAIL DESIGN

5.1 DETAIL DESIGN CONSIDERATIONS (REFER WSA02-5.2)

5.1.1 CATCHMENT DESIGN (REFER WSA02-5.2.1)

Where future development has the potential to occur beyond the estate, estate sewer reticulation is to be consistent with a catchment master plan. In the absence of a master plan prepared by Council a master plan must be prepared by the developer to an extent necessary to determine sewerage component sizing and location within the estate so that orderly development can occur.

Estate sewerage reticulation shall be extended through the estate to service future upstream catchments. Sewer extension to service the upstream catchment shall be subject to Council approval at the cost of Council. Easements shall be created as part of an approved estate master plan to enable sewer construction that is not dependent and restricted by estate staging and lot release. Construction may be either directed by Council or alternatively constructed by the Council or its representatives.

5.1.2 DESIGN ACCURACY (REFER WSA02-5.2.2)

Location in plan shall be referenced to MGA (Map Grid of Australia) coordinates.

5.1.3 EASEMENTS (REFER WSA02-5.2.8)

Sewers located in property other than owned by Council are to have an easement in favour of Council. The Developer is responsible for obtaining this easement; the release of the Deposited Subdivision Plan is subject to the creation of this easement. The Developer is to transfer to Council sewer easements provided in the subdivision and execute a transfer and grant of easement in favour of Council pursuant to Section 88b of the Conveyancing Act 1919 No 6, as amended. The minimum width of sewer easement should be 3.0 m.

Development that requires the submission of a development application to Council for approval will require the provision of an easement over existing sewer infrastructure.

Where Community or Shared Title occurs, Council's sewer responsibility ends at the property connection point (typically where the property vertical is located as visible on site outside of easement/Maintenance Holes inside the boundary line of the property). There will be one connection to service the combined community lots. Council may require an easement to be created over part or the entire infrastructure.

5.2 HORIZONTAL ALIGNMENT OF SEWERS (REFER WSA02-5.3)

Road Crossings are perpendicular to the road centreline unless otherwise approved.

5.2.1 ALL CHANGES IN DIRECTION USING MAINTENANCE HOLES (REFER WSA02-5.3.6)

An internal maintenance hole through drop between inlet pipe and outlet pipe is required as follows:

Deflection Angle	Drop (mm)
0° to 45°	30
46° to 90°	50
91° to 120°	100

Deflections between 91° to 120° are by approval only. Deflections greater than 120° through Maintenance Holes are not permitted.

5.2.2 HORIZONTAL CURVES IN SEWERS (REFER WSA02-5.3.8)

No curves in sewers will be accepted.

5.3 OBSTRUCTIONS AND CLEARANCES (REFER WSA02-5.4)

Sewer mains located within lots adjacent to stormwater drainage lines shall be a minimum of 750mm clear of the stormwater pipe.

Buildings shall not be constructed over the top of sewer mains. Where this is unavoidable subject to approval of Council, buildings may be constructed over sewer reticulation mains provided they are constructed so that no load from the structure is transmitted to the sewer main and the portion of the main under the building (and for a distance outside of the building shall be 2m minimum) is laid in calcium aluminate cement (CAC) lined ductile iron pipe equivalent to Class PN 35. This concession is made primarily for buildings in established areas and will not be extended to new subdivisions unless special circumstances prevail.

5.4 PIPE SIZING AND GRADING (REFER WSA02-5.5)

5.4.1 GENERAL (REFER WSA02-5.5.1)

Sewers shall be designed for PWWF (Peak Wet Weather Flow) capacity. The maximum and minimum allowable loadings for various pipe diameters are as shown in Appendix A – Sewer Capacity Grading Table.

5.4.2 MINIMUM PIPE SIZES FOR MAINTENANCE PURPOSES (REFER WSA02-5.5.4)

The minimum sewer main diameter is 150mm.

5.4.3 MINIMUM GRADES FOR SEWERS (REFER WSA02-5.5.7)

At the ends of lines the minimum grade is 1 in 80.

5.4.4 MINIMUM GRADES FOR SELF-CLEANSING (REFER WSA02-5.5.7)

The maximum grade of reticulation sewer is limited to 1 in 10.

The minimum grades are shown in a table attached in Appendix A.

The values of Colebrook White roughness to be used in the design of gravity sewers are:

Table 1: Values of Colebrook White roughness

Normal Pipe Size (mm)	Full Flow - for estimation of Peak Hydraulic Capacity	Partial Flow - for estimation of Self-Cleansing Flows
150-300	k = 0.6 mm	k = 1.5 normal k = 3.0 for control lines
375-600	k = 0.6 mm	k = 3.0 mm
Above 600	k = 1.5 mm	k = 6.0 mm

Note: Control Lines are those lines that affect the overall depth of the system. The minimum grade for property sewers is 1 in 60.

5.4.5 MINIMUM COVER OVER SEWERS (REFER WSA02-5.6.3)

In accordance with WSA.

5.4.6 MINIMUM DEPTH OF SEWER CONNECTION POINT (REFER WSA02-5.6.5)

The depth of the junction is to be such that any location within the lot can be drained to it via a pipe with a minimum 300 mm of cover laid at a grade of 1 in 60. The pipe is to be located parallel to boundaries and account for raft slab construction.

5.4.7 DEPTH OF CONNECTION POINT (REFER WSA02-5.6.5.4)

Table 2: Property Sewers

Maximum depth to invert	1.5 m, WAE to include GPS locations mark with tape and marker post.
Termination of sewers that provide for future connection	Mark with tape and marker post

5.4.8 VERTICAL CURVES IN SEWERS (REFER WSA02-5.6.7)

Not accepted.

5.4.9 COMPOUND CURVES (REFER WSA02-5.6.8)

Not accepted.

6. PROPERTY CONNECTION (REFER WSA02-6)

6.1 LIMITATION OF CONNECTION TO SEWERS (REFER WSA02-6.2)

Written approval is required from Council for connection to the existing Council sewerage system. All work is to be carried out by Council approved contractors at the developers' expense. Seven days prior notice is required. All materials are to be supplied by the Developer.

All work conducted on live sewers is to be in accordance with the relevant Workplace Health and Safety Regulations, and Confined Spaces Regulations.

6.2 METHODS OF PROPERTY CONNECTION (REFER WSA02-6.3)

Table 3: Methods of Property Connection

WSA 6.3.3 Buried interface method (type A)	Approved
WSA 6.3.2 IO interface method	Not approved
Reference (Council Standard Drawings)	SD 700, SD 701, SD702

6.3 LOCATION OF PROPERTY CONNECTION POINTS (REFER WSA02-6.5)

Where an unsewered dwelling is located on land that is being developed, the Developer shall connect the dwelling to the sewerage reticulation at his cost as part of the subdivision work. The Developer shall be responsible for the removal of any septic tanks and backfilling of the excavation to the satisfaction of Council. All new sewer mains and Maintenance Holes must be tested prior to the dwelling being connected.

6.4 Y PROPERTY CONNECTION SEWERS (REFER WSA02-6.6)

Not accepted.

7. MAINTENANCE STRUCTURES (REFER WSA02-7)

7.1 TYPES OF MAINTENANCE STRUCTURES (REFER WSA02-7.1)

a)	Maintenance Holes	Accepted.
b)	Maintenance Shafts	subject to council approval on a case by case basis
c)	Termination Maintenance Shafts	subject to council approval on a case by case basis

7.2 SPACING OF MAINTENANCE STRUCTURES (REFER WSA02-7.3)

The maximum spacing of Maintenance Holes is 80m.

7.3 MAINTENANCE HOLES (REFER WSA02-7.6)

All maintenance structures shall be Maintenance Holes unless otherwise approved by Council.

Maintenance Holes are required at all dead ends exceeding 30 m in length. Sewer mains (referred to as junction and lead) that exceed 10m in length are sidelines that require a Maintenance Hole with a 150mm connection where they enter the main at the downstream end. Maintenance Holes are not to be located in road carriageways without specific approval of Council.

Where the development is utilising existing sewer mains or junctions, the mains, Maintenance Holes or junctions must be upgraded to meet the current guideline requirements.

7.3.1 TYPES OF MAINTENANCE HOLE CONSTRUCTION (REFER WSA02-7.6.2)

Cast insitu concrete or precast concrete units are to be as approved by Council. Tapers (cones) are permitted on Maintenance Holes not exceeding 2m depth. The use of tapers (cones) on Maintenance Holes exceeding 2m depth by Authority approval only.

PE, GRP, FRP and other plastics are not accepted.

Maintenance hole is to be constructed as fully cast insitu or fully precast assemblies.

7.3.2 LADDERS, STEP IRONS AND LANDINGS. (REFER WSA02-7.6.9)

Not required.

7.4 MAINTENANCE SHAFTS (MS) / MAINTENANCE CHAMBERS (MCS). (REFER WSA02-7.7)

Maintenance shafts not accepted, terminal maintenance shafts accepted.

8. ANCILLARY STRUCTURES (REFER WSA02-8)

8.1 WATER SEALS, BOUNDARY TRAPS, WATER SEALED MAINTENANCE HOLE'S AND GAS CHECKS (REFER WSA02-8.2)

Not required.

8.2 INVERTED SYPHONS (REFER WSA02-8.6)

Not accepted.

9. STRUCTURAL DESIGN (REFER WSA02-9)

9.1 PRODUCTS AND MATERIALS (REFER WSA02-9.2)

Reticulation Pipes and Fittings must be in accordance with the manufacturers and relevant Standards. The following materials are approved for use:

Table 4: Approved materials for use

Gravity sewer reticulation pipelines may be constructed from;

- PVC-U non pressure pipe and fittings (AS 1260) minimum class SN8.
- **Ductile Iron, PN35, with Calcium Aluminate Cement (CAC) lining type. NOTE: Portland cement concrete lining is not acceptable.**
- **DIOD PVC-M and PVC-O minimum pressure class PN16.**

Gravity sewer trunk pipelines may be constructed from;

- **PVC-U non pressure pipe and fittings (AS 1260) minimum class SN8.**
- **Polypropylene non pressure pipe and fittings (AS 5065) minimum class SNS 10,000 N/m.m**
- Ductile Iron, PN35, with Calcium Aluminate Cement (CAC) lining type. NOTE: Portland cement concrete lining is not acceptable.
- DIOD PVC-M and PVC-O minimum pressure class PN16.

Sewer rising mains may be constructed from;

- Ductile Iron, PN35, with Calcium Aluminate Cement (CAC) lining type. NOTE: Portland cement concrete lining is not acceptable.
- DIOD PVC-M and PVC-O minimum pressure class PN16.
- Polyethylene PE100 minimum pressure class PN16

Other materials may be considered however these materials will require approval on a case-by-case basis.

All pipes should be rubber ring jointed.

Material colours shall be in accordance with WSA 02 Table 4.1 COLOUR IDENTIFICATION OF COMPONENTS IN RETICULATION SEWER SYSTEMS. Non-pressure PVC-U pipe used in gravity sewers ≤DN 300 may be white in colour.

10. PUMP STATIONS

Refer to WSA04-2005 Sewage Pumping Station Code of Australia Version 2.1

Prior to undertaking any work on the design of pump stations meet and discuss with Council's Engineer to determine an agreed approach.

11. PRESSURE SEWER

Pressure sewer will not be allowed.

12. STANDARD DRAWINGS

Council Standard Drawings take precedence over WSA.

No.	Description	Drawing No.
1	External Main Connection Property – Vertical Drop > 1500	SD 700
2	External Main Connection Property – Vertical Drop up to 1500	SD 701
3	Internal Main Connection Property – Vertical Drop > 1500	SD 702

APPENDIX A

SEWER CAPACITY GRADING TABLE

Grade	Pipe size 150 Tenements			Pipe size 225 Tenements			Pipe size 300 Tenements			Pipe size 375 Tenements			Pipe size 450 Tenements			Pipe size 525 Tenements			Pipe size 600 Tenements			Grade
	Min K (in mm)	Max		Min K (in mm)	Max		Min K (in mm)	Max		Min K (in mm)	Max		Min K (in mm)	Max		Min K (in mm)	Max		Min K (in mm)	Max		
	1.5	3.0	0.6	1.5	3.0	0.6	1.5	3.0	0.6	3.0		0.6	3.0		0.6	3.0		0.6	3.0		0.6	
80	1	1	221																			80
90	3	2	208																			90
100	6	4	196	11	8	609																100
110	9	7	186	15	11	580																110
120	13	10	178	20	15	553	28	22	1225													120
130	18	14	170	25	20	530	33	27	1175													130
140	23	18	164	31	25	510	38	32	1129	39		2081										140
150	30	24	158	36	30	492	43	36	1089	44		2007										150
160	35	30	152	41	35	475	49	41	1053	49		1941	58		3188							160
180	48	41	143	52	45	446	61	52	989	61		1825	71		300							180
200	65	56	135	66	57	422	76	65	936	75		1727	86		2839	98		4313				200
220				83	71	401	92	79	890	90		1642	103		2703	116		4104				220
250				113	97	374	120	105	832	117		1536	131		2527	146		3840	163		5511	250
300	204	176	119	186	161	339	184	159	755	172		1395	188		2296	207		3492	227		5013	300
350				324	283	312	269	234	695	242		1287	259		2118	281		3222	305		4627	350
400							389	340	648	332		1199	347		1975	370		3006	396		4316	400
450							577	507	608	448		1120	454		1855	475		2826	504		1060	450
500							1175	1039	575	602		1066	585		1757	600		2674	628		3843	500
550									809			1013	747		1670	748		2544	773		3656	550
600									1191			967	953		1596	926		2430	940		3494	600
650												1126		1531	1138		2331	1134			3351	650
700												1630		1471	1400		2242	1362			3222	700
750												2829		1420	1732		2162	1628			3109	750
800															2185		2089	1948			3006	800
850															2925		2024	2341			2926	850
900																		2850			2825	900
1000																		5668			2673	1000

Version	Date	Changes/Amendments
1	November 2018	Approved issue
2	January 2020	Section 11 updated
2.1	July 2020	Minor Amendments