

Clause	Description	Requirement	Supporting Document
4.2.2	Design Accuracy	Design levels and distances to be in accordance with SA Water requirements:-	Pt1 - 4.2.2 (Pg 2)
4.2.3	Sewer Locations	All mains laid in SA are to meet the requirements of SERVICES IN STREETS. A code for the Design of Infrastructure Services in New and Existing Streets	
4.2.5	Easements	To be in accordance with details shown:-	Pt1 - 4.2.5 (Pg 3)
4.3.7	Horizontal Curves	Method to be as detailed in Pt3-17.2 Table 17.1 plus	Pt1 - 4.3.7 (Pg 6)
4.4	Obstructions and Clearances	To be in accordance with details shown:-	Pt1 - 4.4 (Pg 7)
4.4.5 Table 4.4	Maximum EP for Reticulation Sewers	See revised Table	Pt1 - 4.4.5 (Pg 8)
Table 4.6 Table 4.7	Minimum Grades & Min Grades for Prop Connects	See revised Tables	Pt1 - Table 4.6 & Table 4.7 (Pg 8)
4.6.4	Lot Servicing Requirements	To be in accordance with details shown:-	Pt1 - 4.6.4 (Pg 9)
4.6.5.4	Depth of Connection Point	All Connection points to have riser to surface regardless of depth. See also SCM Drgs Sect K	Pt1 - 4.6.5.4 (Pg 10)
4.6.7	Vertical Curves	Method to be as detailed in Pt3-17.2 Table 17.1 plus	Pt1 - 4.6.7 (Pg 11)
4.6.8	Compound Bends	Compound bends are not to be used without specific approval from SA Water	
5.3	Property Connections	SA Water use the IO interface system	
5.7	"Y" Connections	To be used wherever possible, provided <u>crossfall</u> of the allotments at the front boundary < 0.6 m	
5.8	Length of Connection	Maximum length to be 30 m. Where > 20 m an additional standard IP is required at the mid-point	
6.6.8	Ladders and Step irons	Not required in SA Water infrastructure	
6.6.9	Covers	Gas & watertight covers are not required unless specifically directed by SA Water	
6.7	Maintenance Shafts	To be in accordance with SA Water requirements	Pt1 - 6.7 (Pg 11)
7.2	Water Seals	See SCM Drg H1. Other WSSA systems require approval	
7.5	Vents	See SCM Drg J1-J3. Other WSSA methods require approval	
8.10	Bulkheads /Trenchstops	Required on steep slopes in agreement with SA Water where sewer passes through water body (ie underground stream) or where directed by SA Water.	
Section 9	Design Drawings	Attached SA Water specific requirements apply	Pt1 - Section 9 (Pg 12)
Appendices A, B & D	Flow Estimation	SA Water to be contacted before using these systems	
Additional Design Requirements			
Battleaxe allotments	SA water have minimum access requirements for mains servicing narrow entry (Battleaxe, Hammerhead, Flagpole etc) allotments		Pt1 - AR1 (Pg 18)
Other Design Requirements (see WSCM Specifications)			
Pumping Stations	Until the release of the WSAA Pumping Station Code use the existing criteria		DS11(a)-Section 4
Rising Mains	Until the release of the WSAA Pumping Station Code use the existing criteria		DS11(a)-Section 5

To be used with WSA 02-2002 V2.3

SA Water Supplementary Documentation

Sewerage Code - Part 1 (Design)

Related Requirements

In todays operating environment, water recycling is a critical issue and as a consequence minimisation of wastewater salinity is an important objective for SA Water. Therefore while gravity sewers will always be SA Water's preferred option for their sewerage network, consideration to the designing of sewer mains below the existing ground water table must be taken into account, due to the possibility of saline infiltration into the system. The use of Pressure Sewer Systems or Vacuum Sewer Systems can be considered as an alternate option where gravity systems compromise the recycling objective.

Project specific approval must be obtained from SA Water before commencing any design based on systems other than a Gravity Sewer System.

If any conflict exists between information detailed in these documents refer to SA Water's Water and Wastewater Networks section.

Pt 1 – 4.2.2 Design Accuracy

The Designer shall obtain sufficient survey data including, but not limited to, invert levels (to AHD) at existing MHs, IOs (and connections) into which the proposed sewer(s) will discharge plus any visible and hidden obstructions affecting the design. This is to enable the Designer to prepare the design of the sewerage reticulation scheme as specified herein, and to enable the design to be audited by SA Water.

Any discrepancy between the measured level(s) and any recorded level(s) on plans or Drawings provided by SA Water, or any level which may have been provided by SA Water, shall be reported to SA Water for the appropriate action, as soon as the discrepancy is discovered.

Vertical Accuracy

All levels shall be related to the Australian Height Datum by levelling from a Department of Environment and Natural Resources 'third order' Permanent Survey Mark (PSM).

A Temporary Bench Mark (TBM) shall be established from the 'third order' PSM using differential levelling techniques to Class LC and Order L3 standards of accuracy as described in the Inter-Governmental Committee on Surveying and Mapping (ICSM) Publication 'Standards and Practices for Control Surveys'. The TBM shall be placed on a permanent structure close to the starting point of each contract.

Sewer main inverts and critical design points shall also be levelled to the above accuracy and together with the levels of PSMs and TBMs shall be shown on the Drawings to the nearest 0.001 metre.

To be used with WSA 02-2002 V2.3

Other levels including that of boundary pegs, natural surfaces, cut and/or fill levels, existing connections, etc taken using Electronic Distance Measurement equipment (EDM) shall be to Class D standards of accuracy and shall be shown on the Drawings to the nearest 0.01 metre.

Horizontal Accuracy

Horizontal measurements shall be to Class D and Order 4 standards of accuracy for Electronic Distance Measurement equipment (EDM) as described in the ICSM Publication 'Standards and Practices for Control Surveys', and shall be shown on the Drawings to the nearest 0.01 metre.

Ties to MHs, IOs, connections and occupational boundaries / existing fences within the development or adjacent to the development shall be from cadastral boundaries and shall be shown on the Drawings to the nearest 0.01 metre.

In areas remote from cadastral boundaries, MH and IO locations may be defined using AMG coordinates.

Cadastral boundaries shall be pegged to the accuracy specified in the 'Regulations under the Survey Act, 1992, Section 18'.

Pt 1 – 4.2.5 – Easements

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

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

Location of Sewers/Easements

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

Where this is neither practical nor possible to achieve (eg due to topographical or backfall constraints), sewers shall be located in easements (taken specifically for that purpose).

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

Easement alignments may be located as follow:-

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

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

- suitable vehicle access to the sewer can be demonstrated to SA Water
- the sewer pipeline is well clear of existing or proposed locations of trees and shrubs, in accordance with the minimum clearances specified in the Supplementary Documentation WSA 02 Part 1 - 2.6.5

The minimum horizontal clearance between the outside face of the sewer and an existing or proposed building or structure shall be as detailed in the Supplementary Documentation to WSA 02 Part 1 – 4.4

Minimum Cover in Easements

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

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Categories of Easements

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

CATEGORY 1 Not Shared with Stormwater Pipes

Easement widths and the location of pipes within non shared easements are detailed in the table below.

DEPTH TO INVERT m	PIPE SIZE	EASEMENT WIDTH m	SPACING TO EDGE OF EASEMENT m
≤ 1	DN150 & DN225	2.5	Central (*)
	DN300	5.0	Central (*)
1 to 3.3	DN150 & DN225	3.0	Central
	DN300	5.0	Central
> 3.3	DN150 & DN225	4.0	Central
	DN300	5.0	Central

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

Category 1 Easement Requirements

CATEGORY 2 Shared Sewer and Stormwater Easements

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

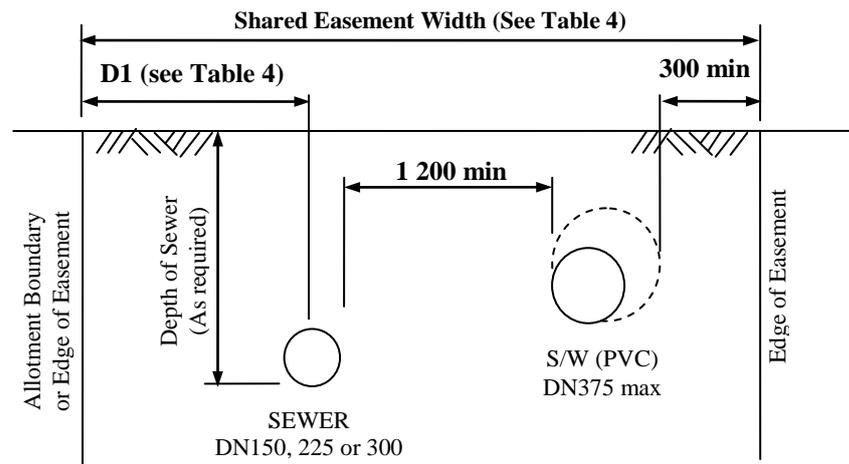
Typical widths of shared easement and the location and clearances of pipes within the shared easement are detailed in the table below.

DEPTH TO INVERT m	PIPE SIZE	EASEMENT WIDTH m	LOCATION	
			Spacing to Edge of Easement D1 (see Fig 1)	Clearance Between Pipes
≤ 1	DN150 & DN225	3.0	1.0 m	1.2m minimum
	DN300	5.0	1.5 m	
1 to 3.3	DN150 & DN225	4.0	1.5 m	
	DN300	5.0	1.5 m	
> 3.3	DN150 & DN225	5.0	2.0 m	1.5m minimum
	DN300	6.0	2.0 m	

Category 2 Easement Requirements

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To be used with WSA 02-2002 V2.3



Category 2 (Shared Easement) Typical Pipework Arrangement

- Where a sewerage easement is shared with a stormwater pipeline, the Council/Developer shall obtain their own stormwater easement from the landowner.
- The stormwater easement may overlap either a portion or the whole width of the SA Water sewer easement.
- The shared easement arrangement must be approved by the Council (or whoever is the owner of the stormwater pipeline).
- Under no circumstances shall the sewer and stormwater pipeline arrangement (as shown in sketch above) be reversed, resulting in the sewer being closer than the prescribed distance from the allotment boundary / edge of easement.
- SA Water takes no responsibility for the stormwater pipeline, other than any damage caused to the stormwater pipeline by SA Water personnel or personnel contracted by SA Water.

Historically, SA Water has acquired wider sewer easements to accommodate sewer and stormwater pipelines, primarily to facilitate sub-divisional activity and to accommodate Council requirements for back-of-block or side-of-block stormwater pipelines. SA Water has no obligation to do this.

For the following special situations, SA Water shall determine easement widths as well as pipeline alignments within easements, on a case by case basis:-

- at SA Water's discretion for situations where site specific conditions warrant additional evaluation (e.g. excessive depth of sewer, angle of repose considerations, difficult access requirements etc.).
- for large diameter stormwater pipelines (greater than DN375)
- where butt jointed concrete stormwater pipes are used:-
 - leakage from the stormwater pipes into the single size granular sewer embedment media is very likely, thereby unnecessarily exacerbating the existing 'french' drain effect associated with sewers
 - replacing a section of sewer adjacent to a discontinuous stormwater pipeline (e.g. butt jointed concrete pipes) is unnecessarily difficult and expensive, requiring special side support for the individual concrete pipe lengths.

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To be used with WSA 02-2002 V2.3

Easements obtained under Developer Contracts

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

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

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

Pt 1 – 4.3.7 – Horizontal Curves

Rubber ring joints are not permissible for PVC (<DN300) or PE sewer pipe and therefore the cumulative joint deflection method is not permissible for these pipes

The following allowable Minimum Curve Lengths are applicable for manual cold bending of PVC sewer pipes

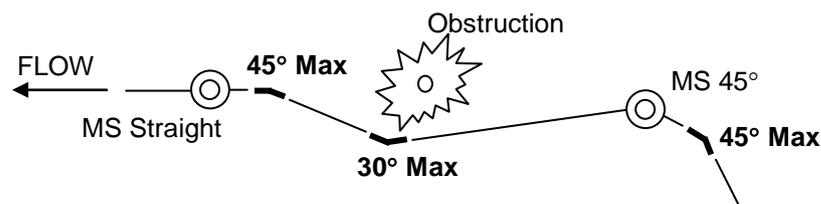
Horizontal Curves	Minimum Curve Length	
Deflection Angle	150 mm Diameter	225 mm Diameter
Up to 10°	6 metres	12 metres
10° to 22°	12 metres	24 metres

IOs shall be provided at the tangent points at the beginning and end of each horizontal curve except in the case where a curve commences or ends adjacent to a MH. In this situation, the IO nearest the MH is not required.

Manufactured (Variable) Bends

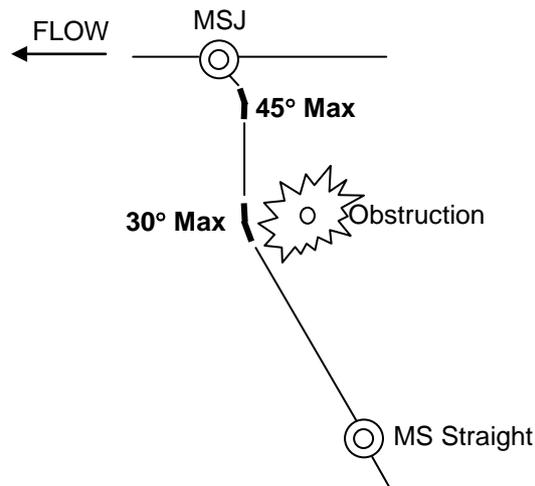
Short radius bends– (635 mm nominal radius) up to 45° can be used immediately upstream of straight through maintenance shafts and maintenance shaft junctions.

Long radius bends – (3000 mm nominal radius), up to a 30° or a combination of up to 30° (ie. 2 x 15°) manufactured bends can be used between any two maintenance structures to miss obstacles (eg trees). This is in addition to the 45° short radius bend mentioned above. See sketches below.



USE OF VARIABLE BENDS - Deflections between consecutive MS's

To be used with WSA 02-2002 V2.3



USE OF VARIABLE BENDS - Deflections between MSJ and an MS

Manufactured variable bends must be used in accordance with SA Water's MS design criteria.

Pt 1 – 4.4 – Obstructions and Clearance

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

Clearances from Existing Structures:

The minimum horizontal clearance between the barrel of the proposed sewer (connection or pumping main) and an **existing** wall or building shall be a distance equivalent to the **greater** of:-

- the depth of the sewer trench plus half the trench width, or
- a minimum of 1.5 metres

Reduced clearances are possible if the building footings are founded on piers extending to at least the invert level of the sewer.

Clearances from Proposed Structures

The minimum horizontal clearance between the barrel of a sewer (connection or pumping main) and a **proposed** wall or building (to be erected after installation of the sewer) shall be as tabulated in table shown below.

Sewer Diameter and Depth	Clearance to Wall or Building (mm)
DN150 & DN225 (< 3.3 m deep)	1500 #
DN150 & DN225 (> 3.3 m deep)	2000 #
DN300 & DN375	2500 #

Based upon minimum permissible easement widths for varying sewer sizes and depths.

To be used with WSA 02-2002 V2.3

Clearances from Trees

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

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

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

Pt 1 – 4.5.5 & Table 4.4– Maximum EP

The maximum EP design values allowable by SA Water are as follows

Pipe Size DN	Maximum Allowable EP	Equivalent No. Properties
150	1000	400
225	2500	1000
300	4500	1800

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Pt 1 –4.5.7 plus Tables 4.6 & 4.7 – Minimum Grades

The minimum design grade values allowable by SA Water are as follows

Reticulation sewers DN	Absolute Minimum grade* %
150	0.50
225	0.30 - Residential
	0.50 - Non-Residential
300	0.20
Branch and trunk sewers DN	Absolute minimum grade %
375	0.15
450	0.14
525	0.12
600	0.10
750	0.08

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ABSOLUTE MINIMUM GRADES (Table 4.6)

**Note: All grades less than 0.50% may only be used with prior approval from SA Water and where expected flows will be sufficient to maintain a self-cleansing velocity.*

To be used with WSA 02-2002 V2.3

Situation	Minimum grade
Internal property drain	1.65% as per AS 3500
DN 100 property connection sewers	2.0%
DN 150 property connection sewers	0.8%
DN 225 Non-Residential / commercial connection sewers	0.8%
Permanent upstream ends of DN 150, 225 and 300 sewers in residential areas with EP \leq 15	0.8%

MINIMUM GRADES –Property connections and permanent ends (TABLE 4.7)

Pt 1 – 4.6.4 – Lot Servicing Requirements

The connection depth shall be such that any point within the ‘Serviced Area’ as defined below can be drained by gravity to the connection IP via internal consumer drains laid at regulation grades.

‘Serviced Area’ for Residential Allotments

The ‘Serviced Area’ varies for different types of residential allotments as detailed below:-

Traditional residential allotments (areas greater than 450 square metres) which abut a roadway and are served from either the roadway or a side easement:

- The ‘Serviced Area’ shall be that bounded by any street frontage and a parallel line 25 metres (minimum) distant from that frontage, and extending across the full width of the allotment.
- The area beyond the 'Serviced Area' that cannot be served by the connection, shall be shown shaded on the Drawings as detailed on the Example Drawing -Annex B to Supplementary Documentation WSA 02 Pt1 – Section 9 - Design Drawings.

Where sewers are deeper than that needed for the ‘Serviced Area’ (due to other factors), the maximum possible area of the allotment shall be served by the available sewer depth.

Courtyard and Villa allotments (areas equal to or less than 450 square metres) which abut a roadway and are served from the roadway or a side easement:

- The connection depth shall be such that the whole of the allotment can be served by the connection.

'Battleaxe / Hammerhead' shaped allotments (a narrow access block abutting a roadway that is serviced from the roadway).

- As for Traditional Allotments above, except that the 'Serviced Area' as delineated by the 25 metre line shall start at the point beyond the narrow access, where the allotment broadens out.

To be used with WSA 02-2002 V2.3

Allotments abutting a roadway but served from a rear easement:

- For allotments served from a sewer in a rear easement (generally due to a significant backfall from the street frontage), the depth of the connection shall be such that the whole of the allotment, or that area as defined by the local council's building envelope (eg set backs etc), shall be served by the connection.

'Serviced Area' for Non-Residential and Commercial Allotments

For Non-Residential/commercial allotments, the 'Serviced Area' shall be a minimum of 5500 square metres, abutting the **street frontage** for that allotment.

Depending upon the size of the allotment, the 'Serviced Area' can comprise either the entire allotment, or that portion of the allotment abutting the street, but can not comprise **only** a rear or intermediate portion of the allotment (regardless of whether only that portion of the allotment abuts the sewer).

The depth of the connection shall be calculated on the 'worst' case scenario of using a 100 mm diameter consumer drain laid around the perimeter of the 'Serviced Area', at the minimum regulation grade for 100 mm consumer drains, with an allowance of at least 300 mm for pipe **cover** at the upgrade end of the drain when not subject to vehicular traffic, or 500 mm cover where subject to vehicular traffic.

Where a connection laid at maximum depth can not service the minimum 'Serviced Area' of 5500 square metres, the balance of the 5500 square metres shall be serviced by either:-

- (a) filling that portion of the site, or
- (b) providing a second connection from another sewer.

Where there is a requirement to service an area greater than the minimum 5500 square metres, the additional area can be serviced by either (a) or (b) above, or by 'private' pumping into the connection.

In all cases, the area that cannot be served by gravity shall be shown shaded on the Drawings

Pt 1 – 4.6.5.4 –Depth of Connection Point

SA Water Connection point is at the property boundary rather than at the main as shown in this clause. Details are shown in SCM Drawings K1 to K8.

The minimum and maximum depths of the connection point are as follows:

Minimum Depth	1.4 m
Maximum Depth	
Residential	2.6 m
Non-Residential	3.5 m

These may only be varied with the specific approval of SA Water.

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To be used with WSA 02-2002 V2.3

Pt 1 – 4.6.7 – Vertical Curves

Rubber ring joints are not permissible for PVC (<DN300) or PE sewer pipe and therefore the cumulative joint deflection method is not permissible for these pipes

The following allowable Minimum Curve Lengths are applicable for manual cold bending of PVC sewer pipes

Vertical Curves	Minimum Curve Length	
	150 mm Diameter	225 mm Diameter
Up to 20%	6 metres	12 metres
20% to 40%	12 metres	24 metres

IOs shall be provided at the tangent points at the beginning and end of each horizontal curve except in the case where a curve commences or ends adjacent to a MH. In this situation, the IO nearest the MH is not required.

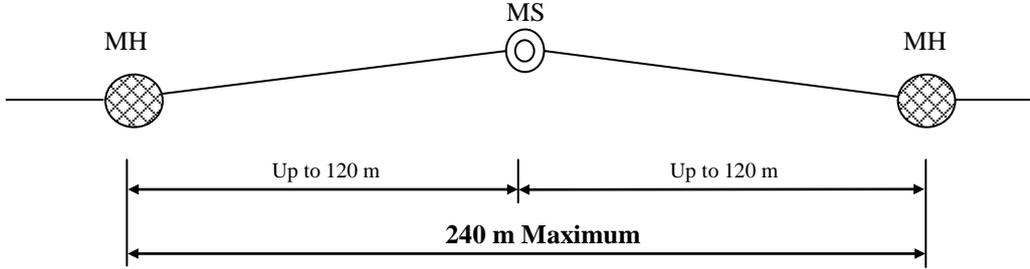
Manufactured variable bends

Long radius bends – (3000 mm nominal radius) can be used adjacent to, or between, any two maintenance structures where changes of grade are required. The use of manufactured variable bends must be in accordance with SA Water’s MS design criteria.

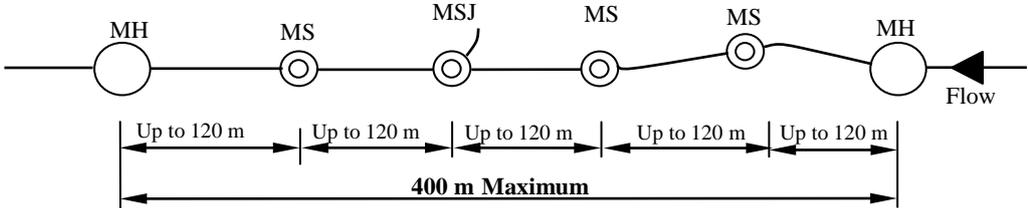
Pt 1 – 2.9.4 – Maintenance Shafts

The following spacings apply in SA Water Infrastructure.

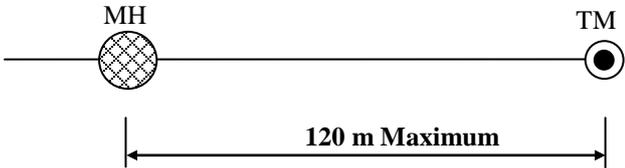
**CONFIGURATION AND SPACINGS FOR MS's AND TMS's
WITHIN SA WATER INFRASTRUCTURE**



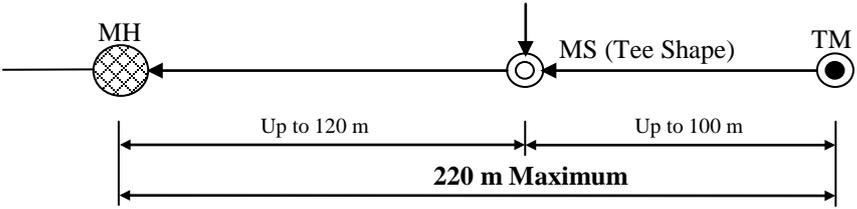
Single MS between consecutive MH's



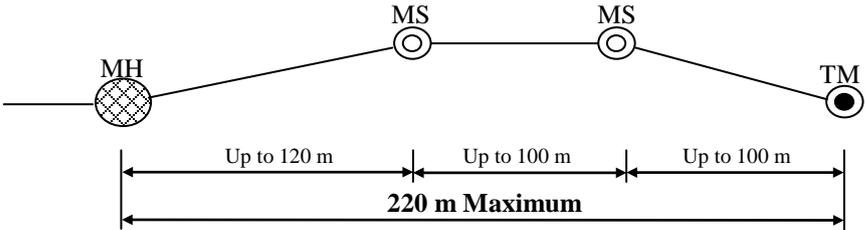
Multiple MS's between consecutive MH's



No MS between 'last' MH and TMS



Single MS between 'last' MH and TMS



Multiple MS's between 'last' MH and TMS

To be used with WSA 02-2002 V2.3

Pt 1 - Section 5 Design Drawings

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

- All Drawing sheets shall be A1 size.
- All Drawings shall have title blocks, alteration blocks, margins etc. in accordance with the South Australian Water Corporation's Standard Drawing format. (refer to Annex B for Example Drawing).
- Special symbols, standard abbreviations and special text sizes for Drawings shall be as shown as attached. (refer to Part 1 Annex A Pages B1-B3)
- Drawings for pumping stations and pumping mains shall form part of the overall set of Drawings for that sewerage scheme, and will be numbered accordingly as part of that set.
- Dimensions and distances shall be shown in metres and shall be to two decimal places and placed as shown in the Example Drawing (refer to Part 1 Annex B).

Composition of Drawings (A Supplementary Drawings Check List is also available)

The Drawings shall:

- Clearly define and detail the full extent of the Works being designed under the Contract.
- Show all interacting services and facilities (including common services, water and stormwater drains) on the plan and longitudinal section views of the Drawings where they cross sewers, connections, pumping mains or appurtenances being designed, or where those services are in close proximity to and/or running parallel to the sewers, connections or pumping mains being designed.
- Provide sufficient information to enable the accurate setting out of the Works by the Constructor including (but not limited to) ties from boundary pegs to MHs, to IOs, to sewer lines, and to pumping lines.
- Where narrow roads are involved (particularly narrow curvilinear roads), the kerb alignments shall also be shown in addition to the other relevant services and features.

Cover/Front Sheet

The Front Sheet shall comprise:-

- **Plan View** of the Sewerage Scheme
 - Correlating the Works to existing infrastructure and existing roads.
 - Drawn to a scale of 1:500 or 1:1000 depending on the allotment size and ensuring that after construction of the scheme, the 'as-constructed' information can be readily and clearly recorded to a standard suitable for microfilming.

As a guide, where allotments in the development have frontages less than 15 metres wide, then the Drawing shall be at a scale of 1:500.

Refer to the Example Drawing in Annex B

- **Location Plan**

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

- **Limit of Contract**

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

- **Permanent Survey Mark (PSM) Details**

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

- **Temporary Bench Mark (TBM) Details**

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

- **Foundation Conditions**

The Drawings shall either:

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

In addition, the Drawings shall :

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

Longitudinal Section:

- **Longitudinal sections** shall comprise:-

- All sewer mains and pumping mains within the Works.
- Existing mains from which multiple new connections are to be laid.
- New connections from existing mains where obstructions exist (eg. stormwater drains).
- New connections where the lengths exceed 15 metres including location of any intermediate IP's when required.

These longitudinal sections shall be drawn to a scale of 1:1000 horizontally and 1:100 vertically and shall show all grades, curves and sizes of the pipes.

Separate Drawings are required for sewer and pumping main longitudinal sections.

Note:

For small land divisions or short extensions of main, the plan view and longitudinal sections may be drawn on the one sheet.

To be used with WSA 02-2002 V2.3

Pumping Stations, Access Roads and Pumping Mains

Where pumping stations are required, a detailed Site Layout Plan of the pumping station shall be prepared to a scale of 1:100, and shall incorporate a Location Plan correlating the works to existing infrastructure and existing roads.

The station Site Layout Drawing shall show all station property boundaries and the general arrangement of the sump, control Maintenance Hole (MH), valve chamber, switchboard cubicle, venting arrangements, power supply, telemetry, sewers, pumping main, water service, vehicular entranceways, fencing and all relevant levels (eg site levels and levels at the tops of the sump, valve chamber, control MH and top of switchboard cubicle base slab). AMG coordinates of the sump and the control MH are also required.

In circumstances where the station does not abut a public roadway, a detailed Plan view, Longitudinal Section view and Cross Sections of the access road and vehicle turn-around areas shall be prepared to a scale of 1:200 horizontally and 1:20 vertically, and shall include all site levels, site gradients, transition gradients, all earthworks including the extent of cut and/or fill (ie top and bottom extremities of the cut and/or fill batters), batter gradients, all surface and cut-off drains, embankments to deflect surface waters and shall also detail compaction requirements.

Refer also to Sewer Construction Drawings - Section M for further details regarding pumping stations.

The design of the collection sewers shall commence at the downstream end of the 'Inlet Sewer' (ie distance 00), commencing at the inside face of the pumping station sump.

For pumping mains, the detailed Plan and Longitudinal Section Drawings shall show all distances, invert levels, all vertical and horizontal curves (if applicable), all road and ground levels, as well as the relationship of the pumping main with relevant existing and proposed underground services, and all structures.

The Drawings for a pumping main shall commence at the outlet side of the valve chamber (ie Distance 00 at the outside face of the chamber) and shall terminate in a MH (called the Discharge MH).

The pumping main Drawings shall show all horizontal and vertical bend locations, horizontal and vertical curves, and/or joint deflections where used, at their respective distances, and shall also quote the actual value of the bend/s (eg 45 degrees) and/or joint deflection (eg 1 degree).

Air-relief valves, pump-out branches etc shall also be shown on the Drawings.

The standard note regarding 'Effluent Disposal' to be added to the 'Limit of Contract' on the front sheet of the Drawings for Developer funded schemes involving pumping stations.

Vertical and Horizontal Curves

For vertical curves, the distance and invert levels shall be calculated at the tangent points of the curve and shall be shown on the longitudinal section view of the Drawings.

Where the curve length is greater than 6 metres, the distance and invert level at the centre of the vertical curve, (ie opposite the curve intersection point) shall also be calculated and shown on the Drawings.

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For horizontal curves, the distances and invert levels at the tangent points shall be calculated and shown on the Plan and Longitudinal Section views of the Drawings.

For every horizontal curve, a table shall be provided on the plan view Drawing detailing:

- the curve length,
- the deflection angle,
- the radius of the horizontal curve,
- the tangent length,
- the offset measurement from the curve to the intersection point.

Connections

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

- the final design ground level
- the connection invert level

Where the ground level at the connection location will be altered, the 'connection box' on the plan view of the Drawings shall show:

- the existing ground level
- the final design ground level
- the connection invert level

Refer to the Example Drawing (Annex B).

Technical Audit of Drawings

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

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

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

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

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

Issue of Drawings

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

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

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

Amendment of Drawings

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

Recording As-Constructed Information

The Designer or a nominated representative shall mark up the original of the latest edition (or amendment) of the Drawings with the 'As-constructed' data, as referenced in WSA 02 Part 3

SA Water Supplementary Documentation

Sewer Code - Part 1 - Design

Additional Requirements

Part 1 – AR1 Battleaxe / Hammerhead Allotments

This additional requirement applies to allotments that are located behind other allotments with a street frontage and require a narrow access corridor for the provision of water and /or sewerage services. These allotments are described in a variety of ways with the most common being “Battleaxe”, “Hammerhead” and “Flagpole”.

SA Water has established minimum width requirements for these narrow corridors to protect the main(s) from building loads and for maintenance access. The minimum widths are as follows:

DEPTH TO INVERT m	PIPE SIZE	CORRIDOR WIDTH m	SPACING TO EDGE OF CORRIDOR m
SEWER MAIN ONLY			
≤ 1	DN150 & DN225	2.5	Central (*)
	DN300	5.0	Central (*)
1 to 3.3	DN150 & DN225	3.0	Central
	DN300	5.0	Central
SEWER AND WATER MAIN			
≤ 1	DN150 & DN225	3.0	1.0
	DN300	5.0	1.5
1 to 3.3	DN150 & DN225	3.5	1.5
	DN300	5.0	1.5

(*) Where there are immovable obstacles along the centreline of the corridor (eg nearby trees) **and** the sewer depth to invert is less than or equal to 1.0 metre, the sewer centreline can be located 1.0 metre off the corridor boundary that is most distant from any building or proposed building.

Where both water and sewer mains are included in the corridor the minimum horizontal clearance between pipes shall be 600 mm.

The minimum horizontal clearance between the outside face of the sewer and an existing or proposed building or structure shall be as detailed in the Supplementary Documentation to WSA 02 Part 1 – 4.4

The property developer shall be responsible for all costs associated with the acquisition / provision of any access corridor(s) that are required for the development.

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Part 1 – AR2 Multiple Dwelling Site Requirements

Maximum Number of Dwellings to a Single Connection

For multiple dwelling developments the maximum number of dwellings to a single connection shall be as follows:

Sewer Connection DN	Maximum Number of Dwellings
DN 100	8
DN 150	Unlimited

Arjdt
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Absolute Minimum Grade

For multiple dwelling developments the absolute minimum grade shall be as follows:

Sewer Connection DN	Absolute Minimum Grade
DN 100	1%
DN 150	0.5%

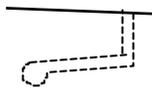
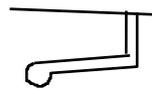
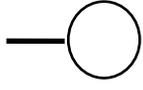
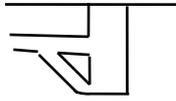
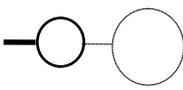
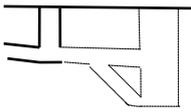
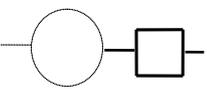
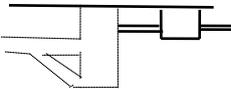
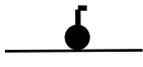
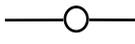
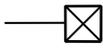
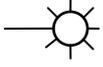
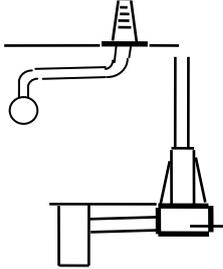
**SYMBOLS AND ABBREVIATIONS FOR DRAWINGS
AND AS-CONSTRUCTED AMENDMENTS**

ITEM	SYMBOLS		SIZE IN PLAN (in mm)
	PLAN	SECTION	
Sewer Main			
<ul style="list-style-type: none"> Existing 	150 PVC 0.5% FB369p7		0.5 thk
<ul style="list-style-type: none"> Proposed 			1 thk
<ul style="list-style-type: none"> Future 			0.75 thk
Pumping Main			
<ul style="list-style-type: none"> Existing 			0.5 thk
<ul style="list-style-type: none"> Proposed 			0.7 thk
All Mains and Connections			
<ul style="list-style-type: none"> Abandoned 			0.7 thk
Change of Pipe Type			
Change of Grade			
MAINTENANCE STRUCTURE			
Maintenance Hole (MH)			
<ul style="list-style-type: none"> Existing 			4 dia
<ul style="list-style-type: none"> Proposed 			4 dia
Maintenance Shaft (MS)			4 dia x 3 dia
Inspection Opening (IO)			2.2 dia
Maintenance Shaft Terminal (MS terminal)			3 dia x 2.2 dia

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**SYMBOLS AND ABBREVIATIONS FOR DRAWINGS
AND AS-CONSTRUCTED AMENDMENTS**

ITEM	SYMBOLS		SIZE IN PLAN (in mm)
	PLAN	SECTION	
Connections <ul style="list-style-type: none"> • Existing • Proposed 	 	 	<p>0.25 thk 1.0 dia</p> <p>0.5 thk 1.2 dia</p>
Pumping Station (PS)			6 dia
Control Maintenance Hole (MH)			4 dia
Valve Chamber (VC)			4 sq
Stop Valve (SV)		As for Plan	2 eq
Reflux Valve (RV)		As for Plan	2 eq
Scour Valve (Sc)		As for Plan	2 dia
Sewer Air Valve (Similar to Water Supply Fireplug - FPAV)		As for Plan	2 dia
Vents <ul style="list-style-type: none"> • Induct • Educt 	 		<p>3 sq</p> <p>3 dia</p>

To be used with WSA 02-2002 V2.3

ABBREVIATIONS

PIPE MATERIALS

PVC Poly Vinyl Chloride

PE Polyethylene

May be used where special, project based, approval has been given by SA Water

PP Polypropylene eg SewerMAX

RCRJ Reinforced Concrete **Rubber Ring Jointed**

DICL Ductile Iron Cement Lined

MSCL Mild Steel Cement Lined

GRP Glass Reinforced Plastic

ABS Acrylonitrile Butadiene Styrene

VC Vitreous Clay

Insert Typical Drawing Here

To be used with WSA 02-2002 V2.3

Document Update Information

Date	Change Type	Page Number(s)	Details
1 Dec 2009	Revision 1	4 8 10 19	Minimum cover in easements specified Maximum EP changed Minimum grades changed Depth connection requirements changed Multiple dwelling development requirements added

To be used with WSA 02-2002 V2.3