

Clause	Description	Requirement	Supporting Document
11.1	Additional Reference Documents	Additions to WSA 02 are as detailed:-	Pt3 – 11.1 (Pg 3)
12.2	Training Requirements	See SA Water requirements	Pt3 – 12.2 (Pg 3)
13.5.3	Disused/redundant sewers	See SA Water requirements	Pt3 – 13.5.3 (Pg 4)
Section 14 & 17.1.4	Materials and Laying Practices	See also WSA 02 Part 2 – Materials comments and SA Water Authorised Products List	Pt3 – Sect 14 (Pg 4)
17.2.3	Horizontal Curves	See SA Water requirements	Pt3 – 17.2.3 (Pg 5)
17.2.4	Vertical Curves	See SA Water requirements	Pt3 – 17.7.4 (Pg 5)
17.2.5	Compound bends	Compound Bends may be used where authorised by SA Water.	
17.3	Separation of Crossing Pipes	Where the vertical gap is < 100 mm the gap is to be filled with a compressible material eg block foam. Pipes are not to be closer than 20 mm	
17.5/17.6	Trench stop/Bulkhead	Use only where specified on design drawings or where an underground stream or water path is identified during construction	
17.9	Marking of property connections and dead ends	All dead ends of sewers and property connections in SA incorporate a raised IO or Terminal MS with cover. This system does not require a marker.	
17.11	Marking Tape	Detectable marking tape is only required above rising main which do not follow a normal road alignment. Non detectable tape is not required	
17.12	Bored pipes under roads, driveways etc	Proposed method and materials are to be authorised by SA Water before commencing boring.	
18.1	Ladders and Step Irons	Ladders and Step Irons are not required in SA Water sewerage infrastructure.	
18.9	MH Covers	Use bolt down system only where directed by SA Water. Install cover frames on a bed of 2:1 sand cement mortar to obtain level. Remove surplus mortar.	
Section 20	Pipe embedment	Unless specifically detailed otherwise on the Design Drawings, all materials and compaction in the embedment are to be as detailed in SA Water Sewer Construction Drawings Section G.	
20.2	Embedment Material	Unless specified otherwise, embedment shall be authorised 10-7 mm aggregate SA10-7 (PM 43) or an authorised 10 mm coarse aggregate.	
21.1	Trench fill	Variations to WSA 02 are as detailed:-	Pt3 – 21.1 (Pg 5)
22.3	Compaction Testing	Variations to WSA 02 are as detailed:-	Pt3 – 22.3 (Pg 6)
22.4.2.2	Air Testing of Sewers	The existing air test for sewers may also be used. Vacuum testing will become the preferred option	Pt3 – 22.4.2.2 (Pg 7)
22.6	Deflection Testing	Test to be carried out when specified by SA Water	
22.4	Maintenance Shaft Testing	The MS riser shafts are to be sealed and the MS installation(s) is to be tested as part of the sewer air test	
22.4.4	Maintenance Hole Testing	All MHs are to be tested. In addition to the vacuum test shown in the code, water testing is also acceptable. (See Supplementary Requirements)	Pt3 – 22.4.4 (Pg 7)
More "Supplementary Requirements" and "Additional Construction Requirements" on next page			

Clause	Description	Requirement	Supporting Document
22.7	CCTV Inspection	As of 1 st July 2014 CCTV recording is required for all new gravity sewers.	
Section 23	Tolerances (as-constructed)	Variations to WSA 02 are as detailed:-	Pt3 – Sect 23(Pg 7)
Section 24	Connection to existing main	Additions to WSA 02 are as detailed:-	Pt3 – Sect 24(Pg 9)
Section 26	Work as Constructed	Variations to WSA 02 are as detailed:-	Pt3 – Sect 2 (Pg 9)

Additional Construction Requirements	
Description	Supporting Document
Inspection and Test Plans (I&TPs), based on those shown on the WSAA website or a similar format, are to be established for all projects as part of the Civil Contractors Federation's (CCF) Integrated Management System (IMS).	
Grading between Steep and Flat Sewers	Pt3 – AR1 (Pg 12)
Geotechnical / Shoring Responsibilities	Pt3 – AR2 (Pg 12)
Issue of Certificate of Practical Completion	Pt3 – AR3 (Pg 13)
"Notice of Intent" requirements	Pt3 – AR4 (Pg 14)
Constructor's indemnity requirements	Pt3 – AR5 (Pg 15)
Extra Excavation – Junctions & Connections	Pt3 – AR6 (Pg 15)
Defect Advice Sheet	Attachment
Corrective Action Request	Attachment

SA Water Supplementary Documentation

Sewerage Code - Part 3 (Construction)

Related Requirements

Pt3 – 11.1 Additional Reference Documents

The following documents are referenced in SA Water's Supplementary Documents.

SA Water Specifications

TS 3(c)	Fine and Coarse Calcareous Aggregates (Marble) for Concrete in Sewerage Structures.
TS 4	High Resistivity Packing Sand for Sintakote-coated MSCL and Polyethylene Sleeve DICL Pipes.
TS 29	The Protection of Field Joints and Specials in Below Ground Pipelines Using Petrolatum Anti-Corrosion Tapes and Compounds
TS 81	The Protection of Field Joints and Specials and Repair of Coatings on Below Ground Steel Pipelines Using Bitumen Mastic Tapes and Compounds.
TG 11(a)	The Design of Sewerage Systems (Extract of Parts 4 and 5)
TG 16	Checklist: Detail Design of Major Wastewater Collection Infrastructure
TG 127	Trenching & Ground Support Systems

Transport SA

- SA10-7 (was PM43) Screenings 10 – 7 mm or alternatively 10mm OR 14mm nominal single-size aggregate as per Table 1 of AS 2758.1 – 1998
- (TSA Website - <http://www.roads.sa.gov.au/corpserv/caps/standcontdoc.asp>)

Safework SA Requirements

Handbook Trenching & Ground Support Systems.

EPA Requirements

Australian and New Zealand Environment and Conservation Council Guidelines (ANZECC) - Sewerage System Overflows

Pt 3 – 12.2 Training Requirements

During the construction phase, staff working on SA Water's sewerage infrastructure must have completed the following specific training courses.

Course (or equivalent)	Minimum Requirement	Remarks/Available at
Common Induction Training Course	All	Also called Whitecard / CivilTrain (CCF)
DICL pipelaying	One Person (on site during activity)	Century Plus
PVC pipelaying	One Person (on site during activity)	CivilTrain (CCF)

To be used with WSA 02-2002 V2.3

PE pipelaying	One Person (on site during activity)	See PIPA web site. http://www.pipa.com.au/
Live Link-up course	One Person (on site during activity)	TAFE (Regency Park)
Trenching and Shoring (Excavation and Support)	One Person (on site during activity)	CivilTrain (CCF)
Work Zone Traffic Management Course	One Person (on site during activity)	CivilTrain (CCF)
Confined Space Awareness Course	Everyone involved in confined space activity (during activity only)	CivilTrain (CCF)
OHS Load Slings Competency	Anyone involved in loading activity (during activity)	To meet OHS Regulations/ CivilTrain (CCF)

Training available at:

Century Plus - Tyco Water Customer Centre Melbourne (Ph: (03) 9217 3131)

CivilTrain - CCF House, 1 South Rd Thebarton SA 5031 (Ph (08) 8111 8022)

CCF - Civil Contractors Federation, CCF House, 1 South Rd Thebarton (Ph (08) 8111 8022)

TAFE - Regency College, School of Plumbing Regency Park (Ph (08) 8348 4311)

Pt 3 – 13.5.3 Disused /Redundant Sewers and Connections

Where a sewer is to be taken out of service the following action is to occur:

- The ends of the sewer are to be exposed and capped or plugged with concrete. The integrity of the remaining section of main is to be maintained to allow possible future use / reinstatement of the main.
- Unless they are being reconnected to a new main, all existing connections to the disused sewer are to have their IP covers (and any supporting blocks) removed and the riser is to be lowered to 1 m below ground level and the remaining vertical section capped or plugged with concrete.
- Details are to be shown on the “As Constructed” drawings and the drain and /or connection to the main marked as “Disused”.

Where an existing property connection is to be taken out of service the following action is to occur:

- The connection is to be sealed from within the main using either a fibreglass in-main seal (covering a minimum of 300 mm either side of the connection opening) or a fibreglass blind ended connection liner. The liner is to be installed by an accredited mains lining company.
- The IP cover, and any supporting blocks, are to be removed and the riser is to be lowered to 1 m below ground level and the remaining vertical section capped or plugged with concrete.

Pt 3 – Section 14 Materials and Laying Practices

All pipe materials and fittings used within the SA Water infrastructure system are to be authorised by SA Water. The most current version of SA Water’s “Authorised Items for Sewer Systems” is to be taken as the source document for this purpose. The Authorised Items Lists are available on the SA Water Internet site.
(<http://www.sawater.com.au/SAWater/DevelopersBuilders/NetworkInfrastructureStandards/>)

Solvent welded PVC sewer pipe is the common construction material for sewers within SA Water infrastructure.

The Sewerage Code includes the option of using metallic pipe systems (eg Steel, DICL and CICL), but these are only to be used where their mechanical properties are required for operational purposes and this will be detailed on the Design Drawings. Where they are specified, the embedment, trench fill and corrosion protection conditions detailed in the Water Reticulation Code (WSA~03) shall be used.

To be used with WSA 02-2002 V2.3

General Laying Practices

Embedment material shall not be placed around any PVC pipe when the ambient temperature adjacent to the pipe is **more than 27°C** unless special precautions to cool the pipe (as approved by the Superintendent's Representative) have been taken.

Pt 3 – 17.2.3 Horizontal Curves

Horizontal curves shall be constructed at the location and to the geometry as specified in the Design Drawings.

Manual Cold Bending

Horizontal curves of up to 30 degrees total or combinations up to 30 degrees (between maintenance structures) can be used on 150 mm and 225 mm diameter PVC sewers (ie flexible pipelines) to effect changes of grade and direction without the need for Maintenance Holes (MHs). These curves shall be formed by manually (not mechanically) cold bending the pipe barrel to a uniform radius as specified, providing the ambient temperature exceeds 5°C. The trailing socket shall be securely jointed and restrained during the bending operation to ensure no forces are transmitted to the joint.

Connections cannot be installed on horizontal curves, due to the unacceptable stress concentrations on the pipeline around the curve.

For PVC sewers larger than 225 mm diameter, changes in direction can only be made at Maintenance Holes.

Curves shall not commence any closer than 1.5 metres from the centre of an MH. However, where a MH has a large external type jump-up, the curve shall commence clear of the jump-up.

Manufactured (Variable) Bends

Short radius bends—635mm radius up to 45 degrees can be used immediately upstream of straight through maintenance shafts and maintenance shaft junctions.

Long radius bends – 3000mm radius, up to 30 degrees total or combinations up to 30 degrees (ie. 2 x 15degrees), are to be used for all variable bends located between maintenance structures. This is in addition to the 45 degree short radius bend mentioned above.

Pt 3 – 17.2.4 Vertical Curves

Vertical curves shall be constructed at the location and to the geometry as specified in the Design Drawings.

Manual Cold Bending

The criteria for Horizontal curves detailed above apply for Vertical curves as well.

Manufactured (Variable) Bends

Use long radius bends (R=3000) for vertical changes of grade.

At this stage unlimited vertical changes of grade are allowable between maintenance structures.

But anything out of the ordinary such as grading down steep slopes should be referred to SA Water before going too far into the design.

Pt 3 – 17.12 Bored Pipes

Directionally bored pipes under roads, railway corridors and driveways etc. shall be set at a Minimum grade of 2.0%. The methods and materials to be used must be authorised by SA Water as fit for purpose, prior to the commencement of boring. The 2.0% grade requirement, allows for any unforeseen reduction in grade, due to below ground obstructions (e.g. rock or other material).

To be used with WSA 02-2002 V2.3

Pt 3 – 21.1 Trench Fill

Unless specifically detailed otherwise on the Design Drawings, all materials used in the trench fill zone for sewers and pumping mains, and the compaction to be achieved in those materials, are to be as detailed in SA Water Sewer Construction Drawings Section G.

Where TS4 sand is used as the trench fill material, a layer of geotextile fabric, which covers the width and length of the embedment, shall be placed on top of the embedment material before any trench fill material is put in place.

Pt 3 – 21.3 – Compaction Testing

The Constructor shall be responsible for all compaction testing (including any additional testing, and re-testing for whatever reason) and shall arrange for the testing to be carried out by a NATA certified Testing Agency.

Prior to commencing the project, **the Constructor shall, in conjunction with the Superintendent's Representative, develop a test plan** showing zones where compaction tests shall be undertaken including the number and depths of the compaction tests within each zone in accordance with the frequency criteria detailed below. The zones shall be selected so that the results are representative of the entire works (pipelines, connections and structures).

The Testing Agency shall randomly select the test locations within each agreed test zone and shall coordinate compaction testing with the Constructor's work programme.

The Superintendent's Representative may, at his discretion, direct the Testing Agency Staff to undertake additional tests within any zone, and in addition the Superintendent's Representative also reserves the right to carry out an independent audit of the Testing Agency's test procedures and test results. The cost of all compaction control testing including any additional testing, and re-testing for whatever reason shall be fully borne by the Contractor.

Testing Frequency

For sewers and connections, there shall be a minimum of one field density test within each one metre depth of trench fill:

- (a) at each maintenance hole, and
- (b) for each 50 metre length of sewer trench (**and** between any two adjacent maintenance holes where the maintenance hole spacing is less than 50 metres), and
- (c) in at least 20% of the trenches for connections. ***Must be in the same project. To be carried out in road pavement up to 300mm behind kerb line or road shoulder to road pavement compaction requirements.***

or as otherwise directed by the Superintendent's Representative.

For pumping mains, there shall be a minimum of one field density test per 50 metre length of trench within each one metre depth of trench fill, or as directed by the Superintendent's Representative.

Under no circumstances shall compaction testing be clustered within a zone or at the boundaries of adjacent zones.

In deep trenches where compaction testing is required for each one (1) metre thick layer of trench fill, the test locations shall be staggered from those in layers above or below by at least 5 metres for sewers and pumping mains and by 2 metres for connection trenches, wherever possible.

Compaction Test Certificates

Prior to the issue of the Certificate of Practical Completion for the Works, the Superintendent's Representative shall review the individual compaction test record sheets and Certificates of Compliance from the NATA certified Testing Agency confirming that:

To be used with WSA 02-2002 V2.3

- compaction tests have been undertaken in accordance with the test plan, and
- the frequency of compaction testing and achieved compaction test results are in accordance with the specified requirements.

Non-compliance of Compaction Testing

If a compaction test fails, further tests shall be carried out as determined by the Superintendent's Representative to determine the full extent of non-compliance. The Constructor shall remove and re-compact the fill from all areas where there is non-compliance at the Constructor's cost, and shall repeat the compaction tests at those locations at the Constructor's cost until accepted as satisfactory by the Superintendent's Representative.

If several areas of the fill fail the testing, then the Superintendent's Representative may declare that the entire sewer run, or connection run, or pumping main run, or around structures etc is unsatisfactory. The Constructor shall at the Constructor's cost remove all trench fill along the declared run, replace the trench fill material and re-compact it until it is accepted as satisfactory by the Superintendent's Representative.

Pt 3 – 22.4.2.2 Air Testing of Sewers

The Constructor shall be responsible for carrying out air testing of sewers including the sewer connections. This test procedure may be used as an alternate to the procedure detailed in the WSAA Code. It is not applicable for testing of PE pipe (see WSA 01-2004). Once the selected test procedure has been commenced it is not permissible to swap to the alternate test procedure.

All pumping and test equipment for air testing shall be supplied by the Constructor. Pressure gauges shall each have a certificate of calibration issued within the last 12 months by an approved NATA registered laboratory.

Sufficient embedment and trench fill material shall be placed around the pipes to ensure the pipes are restrained. Where specifically directed in writing by the Superintendent's Representative, the Constructor shall leave joints exposed to facilitate visual inspection for leakage.

Once all sewer and connection openings are sealed, air shall be introduced slowly until a pressure of 50 kPa is reached. This pressure shall be maintained for a minimum of 3 minutes by use of a pressure regulator (not by use of additional pressure top ups). Should no leaks be detected at the end of the 3 minutes, the air supply shall be shut off, if the 50 kPa pressure is maintained for a further 3 minutes that section of sewer and connections will be accepted as satisfactory by the Superintendent's Representative. If within the 3 minutes a decrease in pressure is observed then provided the pressure of the air contained in the section of sewer under test does not fall below 35 kPa within 15 minutes, that section of sewer and connections will be accepted as satisfactory by the Superintendent's Representative.

If the sewer and/or connections fail the tests, any leaks shall be repaired by the Constructor and following the repairs, the testing shall be repeated at the Constructor's expense until approved as satisfactory by the Superintendent's Representative.

Pt 3 – 22.4.4 Maintenance Hole (MH) Testing

The Consulting Engineer shall be responsible for verifying and certifying the Maintenance Hole (or pumping chamber) testing. All Maintenance Holes (or pumping chamber) shall be tested. This test may be used as an alternative to the one shown in the Sewerage Code of Australia.

Before backfilling around any maintenance hole (or pumping chamber), all sewers, pumping mains and any other penetrations entering or leaving the chamber shall be sealed with a stopper (from within the chamber) and the chamber filled to the top of the concrete with water. A leakage test shall then be carried out for a **minimum of 24 hours**.

To be used with WSA 02-2002 V2.3

The chamber shall be deemed to be satisfactory if it shows no visible leakage of water through the walls of the chamber, and the drop in water level does not exceed 3 mm per hour for the duration of the test.

Note. At the completion of the test, the water shall be pumped from the chamber and not released into the sewer being constructed, or any other existing sewer.

If the MH fails the tests, any leaks shall be repaired by the Constructor and following the repairs, the testing shall be repeated at the Constructor's expense until approved as satisfactory by the Superintendent's Representative.

Pt 3 – 22.7 CCTV Inspection

In line with part 2 of WSA 02 code, SA Water has a life expectancy of 100 years from new sewerage infrastructure. This requirement reflects community expectations of agencies' operational and financial performance. From 1st July 2014, CCTV video recordings and reports are a mandatory requirement for all new gravity sewers.

Mandatory CCTV Inspections – SA Water Minimum Requirements

When engaging a company to undertake CCTV recordings, contractors must ensure that the company are equipped to meet the following requirements;

General

- CCTV recordings are to be made from a stable horizontal base, with the invert of the sewer at the bottom of the screen during recording.
- Recordings are not to be rushed, but paced at a speed necessary for accurate inspection.
- CCTV reports to be submitted in WinCan 8 Format.
- If debris is discovered, the constructor will be responsible for the removal and cleaning of the sewer, at their cost, prior to arranging a subsequent CCTV recording.

Recorded footage and reporting

- CCTV cameras will be required to have the capacity to pan and tilt, pausing to record footage of all joints and junctions. The accompanying report must detail the assessed condition and advise whether good or defective (fish eye lenses are not to be used, as they have the potential to distort images).
- When panning, the camera base must remain stationary.
- CCTV recordings and reports are to be forwarded to the relevant Superintendents Representative, immediately after the report has been completed.

Unforeseen issues

- If the survey is abandoned, the report will need to specify the reason for the abandonment (e.g. Survey Abandoned – obstruction).
- Any maintenance hole issues observed during the CCTV survey, are to be noted as 'general comment' in the report.

To be used with WSA 02-2002 V2.3

Pt 3 – Section 23 Tolerances on As-Constructed Work

Horizontal Tolerances

The tolerance on Maintenance Holes and Inspection Openings (IOs) shall be:

- ± 500 mm along the line of the sewer main, and ± 200 mm perpendicular to the line of the sewer main for Maintenance Holes not located at sewer junctions,
- ± 200 mm in all directions for Maintenance Holes located at sewer junctions.

The tolerance on the dimensions for the standard positions of connection inspection points (IPs) shall be ± 200 mm from any side boundary and ± 100 mm from the street boundary, or other boundaries as detailed in SCM Section G.

The tolerance on the position of pumping mains shall be 150 mm.

Vertical Tolerances Sewers

DESIGN GRADIENT	AS CONSTRUCTED	
	VERTICAL TOLERANCE ON INVERT LEVEL	MIN. ACCEPTABLE GRADIENT BETWEEN ANY 2 POINTS
< 0.3%	± 3 mm	$\geq 0.1\%$
0.3% → 0.5%	± 5 mm	$\geq 0.4\%$ (DN 150) $\geq 0.25\%$ (DN 225, 300)
0.6% → 1.0%	± 8 mm	$\geq 0.4\%$
1.1% → 2.0%	± 10 mm	$\geq 0.8\%$
2.1% → 5.0%	± 20 mm	
> 5.0%	± 40 mm	

Connections

Tolerance on the invert levels at connection inspection points shall be ± 40 mm provided a 2% grade on 100mm connections or 1% grade on 150mm connections is achieved.

Pumping Mains

The tolerance on the depth of pumping mains shall be ± 50 mm providing it does not result in high points. (ie changes from rising to falling gradients), which otherwise would not occur.

Critical Tolerances

For those sections of main where the grades are specified as critical on the Design Drawings, the tolerance on the grade shall be +25%, -10% of the design grade.

The tolerance on any invert level specified as 'critical' on the Design Drawings shall be +3 mm, -10 mm.

To be used with WSA 02-2002 V2.3

Finished Surface Structures and Fittings

SITUATION	TOLERANCES
In road reserves, including sealed pavements, road verges, driveways, footpaths, pedestrian thoroughfares	+10 mm high, - 5 mm low
Sealed and trafficable areas within private properties (pedestrian and/or vehicular traffic)	+15 mm high, - 5 mm low
In private property including garden areas, unsealed areas, non-trafficable areas or areas of occasional traffic (pedestrian and/or vehicular traffic)	+20 mm high, -5 mm low

Pt 3 – Section 24 – Connection to Existing Sewers

The Constructor shall verify on site the actual location and level of the link-up point to the existing sewerage system before work commences. This ensures that the design locations and gradients between the new work and the existing system can be achieved.

If any discrepancy is found between the actual field location and level and the ones shown on the Design Drawings, then the Superintendent's Representative and the Designer shall be notified immediately.

Link-Ups by the Constructor

The Constructor shall give the Superintendent's Representative the required 'notice of intent' prior to carrying out any link-up (see Pt 3 – AR 1).

The Constructor shall ensure that every link-up is:-

- carried out by persons who have been certified by SA Water as having demonstrated their ability to satisfactorily perform the link-up operation, and
- Supervised continuously by a person who has attended and successfully completed an authorised course on Water and Wastewater System Link-ups.

Plungers shall not be installed in sewers without the prior approval of the Superintendent's Representative and he/she must be advised when they have been removed.

Link-Ups by SA Water/SA Water's Alliance Partner

At the discretion of the Superintendent's Representative, trained SA Water/SA Water's Alliance Partner personnel may carry out some or all of the link-ups for a fee.

The Constructor shall give the Superintendent's Representative the required 'notice of requirement' prior to the proposed time for carrying out the link-up (see Pt4 – AR1).

Pt 3 – Section 26 – Work-As-constructed Details

A survey check shall be carried out to ensure the location and levels of all newly constructed sewerage schemes, including (but not limited to) the sewer main, MHs, inspection openings, connections and connection junctions, inspection points, pumping mains, pumping stations, access roadways etc, have been constructed in accordance with the Design Drawings and the Sewerage Code of Australia.

To be used with WSA 02-2002 V2.3

All survey checking and recording work shall be done to a standard acceptable to the Superintendent's Representative, and the updated original of the Design Drawings shall incorporate the As-constructed information as detailed in Supplementary Documentation to WSA 02 Part 1.

For sewers, connections and pumping mains, embedment material shall only be placed up to the top of the pipes (and not above) until the As-constructed survey checking has been carried out.

Construction Information to be provided

The Constructor is to advise the consultant or surveyor (whoever is responsible for producing the As-Constructed Drawings) of the following construction based information:

- a. Details of the actual pipe(s) used in the project. To be in accordance with description code detailed in Part 3 Annex A to this supplement.
- b. Details and locations of all maintenance structures installed including type eg MH, MS and IO including the nominal Internal Diameter eg 1500, 1200, 1050, 900, 225 or 150 mm or other size as applicable.
- c. Details of any ancillary facilities eg Sewer Pumping Station and providing the following information:
 - Type of facility
 - Manufacturer
 - Size, and
 - Other relevant information
- d. Any other variations agreed between SA Water and the Contractor.

Survey Checking

The surveyor shall carry out, or cause to be carried out, a survey check of the locations and levels of the constructed Works. If the locations and levels of the constructed Works are in accordance with this Specification and the Drawings, the Responsible Person shall certify that the Works do so comply.

If the As-constructed works fall outside the tolerances specified, the Constructor shall notify the Superintendent's Representative of the exact nature of the departure from the Design Drawings and correct this departure at the Constructor's cost.

In general, the invert level of a pipe shall be accepted as the level of the top of the pipe less the pipe wall thickness and actual internal diameter.

Distances (and ties where marked *) shall be checked at all:

- Maintenance holes* (including 'control' maintenance holes)
- Inspection openings*
- Connection junctions
- Tangent points of vertical curves (and at the midpoints of curves longer than 6 metres) along sewers and pumping mains
- Tangent points of horizontal curves, including the offset distance from the curve to the intersection point of the curve for sewers and pumping mains.

Levels shall be checked at all:

- For Gradients $\leq 0.8\%$ - Along the sewer at regular intervals <3 m
For Gradients $> 0.8\%$ - Along the sewer at regular intervals <5 m
For Pumping Mains – Along the sewer at regular intervals <5 m
or as specified by the Superintendent Representative

To be used with WSA 02-2002 V2.3

- Maintenance holes (including the inverts of branch sewers entering or exiting the maintenance holes plus the finished level of the top surface of the access cover)
 - In addition**, maintenance hole channels shall be checked to ensure that any changes of grade have been evenly distributed along the channel, and that the additional fall at branches and bends ('jump-up' to compensate for friction head losses) have also been constructed in accordance with SA Water Sewer Construction Drawings - Section L.
- Maintenance Shafts and Inspection Openings (including the finished level of the top surface of the access cover)
- Connection junctions
- Connection IPs
- Tangent points of vertical curves (and at the midpoints of curves longer than 6 metres) along sewers and pumping mains
- Tangent points of horizontal curves, including the offset distance from the curve to the intersection point of the curve for sewers and pumping mains
- Pumping stations, including
 - Sump (as well as inlet sewer invert and invert of rodding branch)
 - Pumping main inverts at valve chamber
 - Top of pumping chamber, top of valve chamber, floor of valve chamber, top of switchboard cubicle base
 - Pertinent site levels
 - Pertinent levels at regular intervals along access roadways, vehicle turn-around areas, including any surface and sub-surface drains.

The Superintendent's Representative reserves the right to check the work of the Constructor at any time.

Should there be a difference of opinion regarding the measurements and levels checked, the opinion of the Superintendent's Representative shall prevail.

Compliance with the Design Drawings

Sewers, connections and pumping mains shall be deemed to comply with the Design Drawings if all of the following criteria are met, allowing for the construction tolerances specified.

- 1) The gradient on any sewer main or sewer connection at any point shall not be flatter than the minimum permissible SA Water design grades.
- (2) The gradient on any sewer main, or connection, or pumping main at any point shall not be flatter than the design grades shown on the Design Drawings.
- (3) Invert levels of 'end' maintenance holes, 'end' IOs, connection IPs and any other points specified on the Design Drawings as being 'critical', shall not be higher than that specified.
- (4) All of the Works comply with the construction tolerances.

Recording As-constructed Information and Certification

The surveyor shall mark up the 'original' of the latest issue of the Design Drawings with all as-constructed data where there is a variance with the latest Design Drawings. Details added to the As-constructed Drawings shall be in accordance with the requirements detailed in SA Water Corporation Supplementary Documentation to WSA 02 Part 1.

To be used with WSA 02-2002 V2.3

The surveyor shall submit the As-constructed Drawings, whether altered or not, to the Superintendent's Representative together with the field survey information. These As-constructed Drawings shall also include the date of completion of construction and certification that the drawings are correct and include all relevant as-constructed information.

Any errors or deficiencies in the as-constructed works discovered before the issue of the Final Certificate shall be corrected or remedied by the Constructor at their expense.

Responsibilities

Private Sector Land Development Contracts

The Consultant shall carry out, or arrange for a suitably qualified surveyor to carry out, the As-constructed survey checks, record all variances and certify that the As-constructed information and Drawings are correct. These drawings shall be forwarded to the Principal Engineer, Network Design (Wastewater), Level 7 GPO Box 1751, ADELAIDE SA 5001 to ensure the information is included on asset management records.

SA Water Administered Contracts

SA Water technical staff shall carry out (or arrange for a suitably qualified surveyor to carry out) the as-constructed survey checks, record all variances and certify that the information is correct. The original As-constructed Drawings are to be given to the technical staff who will ensure the information is included on asset management records

SA Water's Alliance Partner Administered Contracts

The Contractor shall arrange for a suitably qualified surveyor to carry out the As-constructed survey checks, record all variances and certify that the As-Constructed information and Drawings are correct. The certified As-constructed Drawings are to be given to SA Water's Alliance Partner, prior to the issue of the Certificate of Practical Completion, who will forward the information to SA Water for inclusion on asset management records.

To be used with WSA 02-2002 V2.3

SA Water Supporting Documentation

Sewerage Code - Part 3 (Construction)

Additional Requirements

Pt3 – AR1 Grading between Steep and Flat Sewers

Where a sewer is on a steep grade (greater than 5%) discharges into a sewer on a flat grade (less than 1%) at a MH, a minimum 15 metre length of sewer shall be graded within the range 1% to 5% inclusive before the commencement of the flat grade, either immediately upstream or downstream of the MH.

The above condition does not apply where a steep sewer discharges into a MH via a large jump-up or manufactured variable bend.

Pt3 – AR2 Geotechnical / Shoring Responsibilities

The Constructor shall be responsible for:

- (a) assessing the geotechnical and groundwater information provided by the Designer on the Design Drawings or other documents and implementing the appropriate actions.
- (b) the design, installation and operation of all groundwater control and dewatering systems necessary to:
 - (i) prevent heave of, or loss of density in the material comprising the floor of any excavation or pipe trench.
 - (ii) maintain the stability of the walls of all excavations and trenches.
 - (iii) maintain “dry” working conditions in all excavations and trenches.
 - (iv) preventing flotation of any pipeline or structure during construction and at all other times.

Note: Prior to commencing construction, the Constructor shall obtain any further geotechnical or groundwater information necessary for the design of any of the abovementioned groundwater control and dewatering systems.

- (c) confirming, during excavation, whether the geotechnical conditions found on the site are in accordance with those indicated on the Design Drawings or in accordance with any subsequent investigations undertaken by the Constructor.

Where the actual foundation conditions are found to be as indicated on the Design Drawings or by any subsequent investigations undertaken by the Constructor, then the Constructor may proceed with the Works.

Where the foundation conditions are found to be not as indicated on the Design Drawings or by any subsequent investigations undertaken by the Constructor, the Constructor shall not proceed with the Works, but shall refer the design back to the Designer for appropriate action, and shall immediately inform the Superintendent's Representative of the findings.

Construction work shall only proceed after the appropriate foundation treatment has been specified by the Designer and approved in writing by the Superintendent's Representative.

To be used with WSA 02-2002 V2.3

Groundwater Control and Dewatering of Excavations

Where groundwater is encountered, the watertable shall be lowered to below the level of the floor of the excavation or trench (eg by wellpointing) before beginning excavation where:-

- (a) there is the possibility that there may be heave of, or loss of density in the material comprising the floor of the excavation or trench, or
- (b) there may be a threat to the stability of the walls of the excavation or trench, or
- (c) it may otherwise not be possible to maintain “dry” working conditions in the excavation or trench.

Observation wells shall be installed to verify and monitor the lowering of the watertable.

The watertable shall be maintained below the level of the floor of the excavation or trench until the excavation or trench has been backfilled, or until such time as there is no danger of flotation of the newly installed structure or pipes.

The Constructor shall remove any water which may enter or be found in excavations or trenches while the pipes are being laid and while any other works under the Contract are being constructed. The Constructor shall have available at all times sufficient pumping units for this purpose, ready for immediate use.

Provided that there is no possibility that there may be heave of, or loss of density in, the material comprising the floor of the excavation or trench, or a threat to the stability of the walls of the excavation or trench, the Constructor may use the pipe embedment material (where this consists of permeable screenings) to convey water away from the immediate work place to temporary pump sumps formed in the floor of the excavation.

Water from groundwater control systems, excavations or trenches shall be disposed of in accordance with EPA requirements. The constructor shall also ensure that it shall not cause injury to persons or property, to the work completed or in progress, to the surface of the streets, or cause any interference with the use of the streets by the public or be a public nuisance. Dewatering water shall not be discharged into the existing “live” sewerage system.

Shoring of Excavations

The Constructor shall supply, put in place, and maintain such shoring as may be required to support the walls of excavations and trenches to provide a safe working environment for personnel in and around excavations and to prevent any movement which can in any way injure, or endanger any adjacent pavements, buildings, conduits or other structures.

Notwithstanding any special considerations, the minimum shoring required shall be as shown in TG 127 Trenching and Ground Support Systems.

If the Superintendent’s Representative considers that neither sufficient nor proper shoring has been provided, the Superintendent’s Representative may direct that additional shoring be installed at the expense of the Constructor and compliance with such orders shall not release the Constructor from the Constructor’s responsibility for the sufficiency of such shoring.

Care shall be taken to prevent voids outside the sheeting, but if voids are formed they shall be immediately filled, rammed and compacted to the satisfaction of the Superintendent’s Representative.

In order to prevent injury to persons or property, the Superintendent’s Representative may direct the Constructor to, or the Constructor may himself decide to, leave sheeting and/or bracing in place to be embedded in the backfill. However, sheeting or bracing shall not be left in place within 1.2 metres of the surface without written permission from the Superintendent’s Representative.

The right of the Superintendent’s Representative to order additional sheeting and/or bracing, or to order any or all of it to be left in place, shall not be construed as an obligation on the Superintendent’s Representative’s part to issue such orders, and any omission to exercise this right to do so shall not relieve the Constructor of the

To be used with WSA 02-2002 V2.3

Constructor's responsibility for preventing any injury or death of any person, or damage to property, caused by any cave-in or moving of the ground adjacent to the excavation.

All sheeting and bracing which is not to be left embedded in place, shall be removed as the excavation is backfilled in such a manner as not to endanger any personnel, the pipeline or the structure being constructed, or any other adjacent structures, services etc.

Pt3 – AR3 Issue of Certificate of Practical Completion

The Superintendent's Representative will issue the Certificate of Practical Completion when:

- (1) All of the Works have been completed by the Constructor in accordance with the Design Drawings and this Code of Practice, to the satisfaction of the Superintendent's Representative.
- (2) All specified testing has been successfully completed by the Constructor and all certificates of compliance for trench compaction tests have been provided to the Superintendent's Representative.
- (3) All as-constructed information has been provided and certified correct by the Surveyor to the satisfaction of the Superintendent's Representative.
- (4) All the 'common services trenching' including installation of electrical, gas and telecommunication apparatus in that trenching has been completed, and any damage to those installations by the Constructor's works, or damage to the sewers, connections or pumping mains, water supply mains or any other services, caused by the common services work, has been made good to the satisfaction of the Superintendent's Representative and other Authorities.
- (5) The roads in which any sewers or connections or pumping mains etc are laid have been fully constructed or repaired.
- (6) All plungers, tools or any rubbish and foreign matter have been removed from the mains and connections.
- (7) All surplus spoil has been removed from the site and the site cleared and restored.
- (8) All equipment Guarantees and Operating Manuals have been provided to the Superintendent's Representative.
- (9) All outstanding debts have been paid.
- (10) The security has been lodged.

Pt3 – AR4 Notice of Intent

Notification to other Agencies

Where water mains and water connections are laid in public roads, the Constructor shall notify the authority responsible for the road (local government or DOT) a minimum of at least five (5) full working days before commencing work.

Acknowledgment of Intention to Carryout Works

The Constructor shall provide the Superintendent's Representative with written acknowledgment from the authority responsible for the road (local government or TSA) of the Constructor's intention to carryout works before commencing work.

To be used with WSA 02-2002 V2.3

Commencing Work

The Constructor shall give a minimum of seven (7) days notice in writing to the Superintendent's Representative of the Constructor's intention to commence work on the Contract.

Connections to Live Sewer Mains

The Constructor shall give a minimum of 48 hours (excluding weekends) notice, in writing, to the Superintendent's Representative of the Constructor's intention to carry out any link-up.

Testing

The Constructor shall give a minimum of two (2) full working days notice, in writing, to the Superintendent's Representative prior to commencement of any testing.

Link-up by SA Water/SA Water's Alliance Partner

The Constructor shall give a minimum of 14 days notice, in writing, to the Superintendent's Representative of the requirement to carry out a link-up. SA Water/SA Water's Alliance Partner will advise within 7 days if they are able to comply and the required fee.

Pt3 – AR5 Indemnification

Against Losses Due to Delays

The Constructor shall indemnify the Superintendent's Representative from any losses whatsoever due to any delays in accepting the Works (or part of the Works) due to any failures.

Against Cost of Clean up of Water Mains

Should any tools, debris or foreign matter be left in the water reticulation system by the Constructor, or the Constructor's representatives, or sub-constructors, the cost of subsequent removal of such objects, and the cost of repair of any damage caused by these objects shall be fully borne by the Constructor.

Pt 3 – AR6 Extra Excavation – Junctions & Property Connections

Where excavation is in rock, and the sewer or property connection is to be, or has the potential to be extended, the trench is to be extended as follows:-

- beyond the end of the sewer junction 1.5 metres
- beyond the end of the property connection 1.0 metres

Pt3 – AR7 Defect Advice Sheet

The Defect Advice Sheet (see Attachment) is to be used by Inspectors, Constructors or their staff, Manufacturers or any other SA Water or SA Water's Alliance Partner employee to report any non-conforming or defective items or poor quality procedures or services.

One copy of the sheet is to be forwarded to:

Infrastructure Standards Manager
Level 7, 250 Victoria Square, ADELAIDE SA 5000
Area 7.1 GPO Box 1751, ADELAIDE 5001

An additional copy is to be retained by the originator for reference purposes.
All reports will be reviewed and the originator will be advised of the outcome.

To be used with WSA 02-2002 V2.3

Annexures

Annex A As-Constructed Mains Reporting Data
Annex B Typical As-Constructed Drawing

Attachments

Defect Advice Sheet
Corrective Action Request

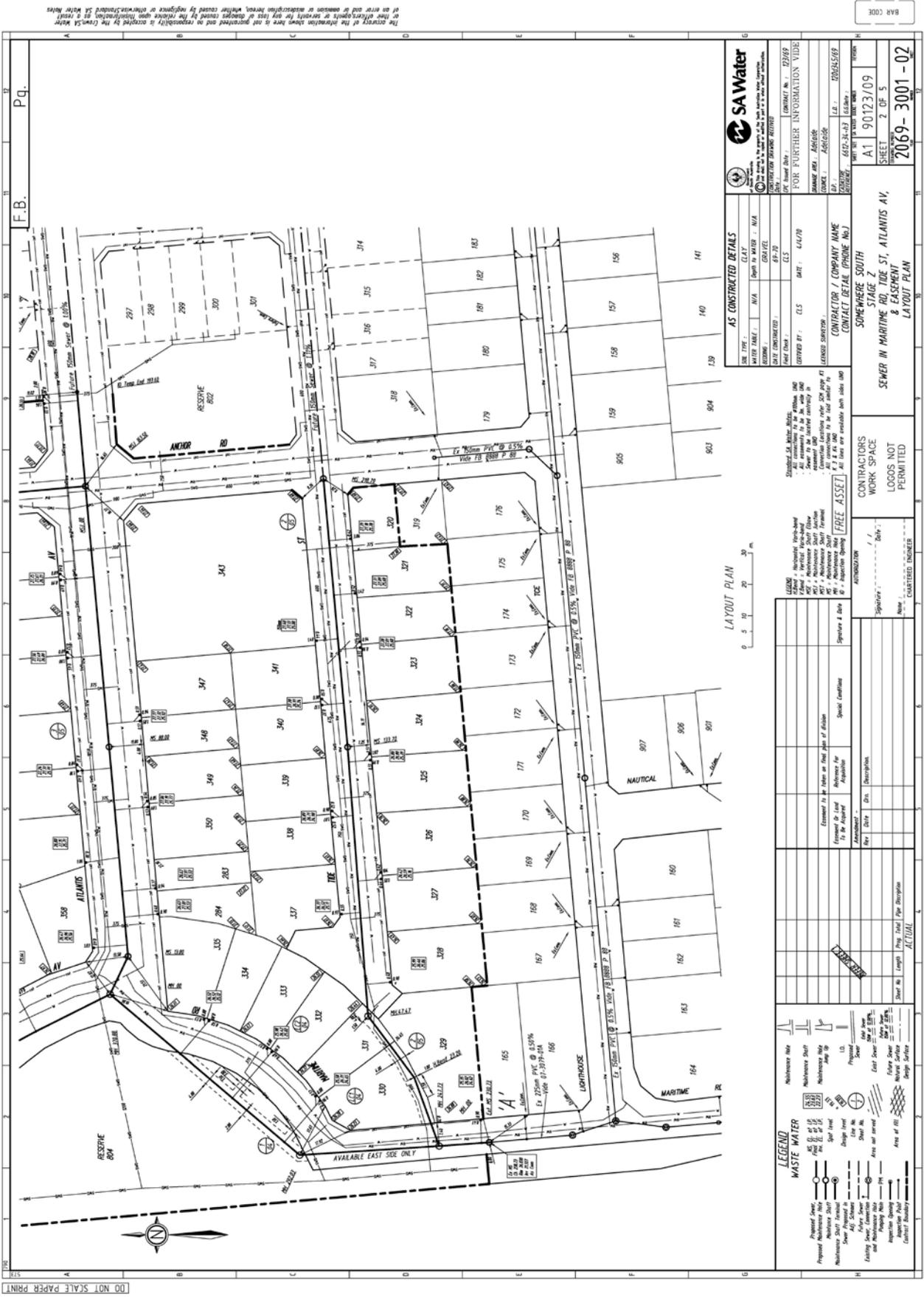
To be used with WSA 02-2002 V2.3

AS-CONSTRUCTED MAINS REPORTING DATA GRAVITY MAINS

PIPE MATERIAL	PIPE ABBREVIATION	PIPE MATERIAL or TYPE	PIPE DESCRIPTOR FOR AS-CON DRG	PIPE DIAMETER (DN)	STIFFNESS RATING (SN) or PRESSURE RATING (PN)	AUSTRALIAN STANDARD
DATA INPUT REQUIREMENT	Standard Symbol	Compulsory -Select as required	Example	Compulsory	Compulsory	Informative
Poly Vinyl Chloride (PVC)	PVC	<ul style="list-style-type: none"> • Solid Wall (SO) • Sandwich (SA) • Ribbed (R) 	PVC (R)	✓	✓	AS/NZS 1260
Polyethylene (PE)	PE80	Type A (A)	PE80 (A)	✓	✓	
		Type B (B)	PE80 (B)	✓	✓	AS 4130
		Type C (C)	PE80 (C)	✓	✓	
	PE100	PE100	PE100	✓	✓	AS 4130
The following format is to be used where special, project based, approval has been given for the specific pipe system to be installed.						
Polypropylene eg SewerMAX	PP	<ul style="list-style-type: none"> • Manufacturer Tradename 	PP (SewerMAX)	✓	✓	Draft AS/NZS 5065
Acrylonitrile Butadiene Styrene	ABS	<ul style="list-style-type: none"> • Manufacturer Tradename • Jointing System • Solvent Weld (SWJ) • Rubber Ring (RRJ) 	ABS (Eurapipe) (SWJ)	✓	✓	AS3518
Glass Reinforced Plastic	GRP	<ul style="list-style-type: none"> • Manufacturer Tradename 	GRP (Iplex)	✓	✓	AS 3571
Concrete	CONC	<ul style="list-style-type: none"> • Calcareous Aggregate (C) • PVC Lined (PVC) 	CONC (C)	✓	✓	AS 4058
Vitreous Clay	VC	<ul style="list-style-type: none"> • Manufacturer Tradename 	VC (Keramo)	✓	×	AS1741

Legend:
✓ Value to be supplied
× No information required

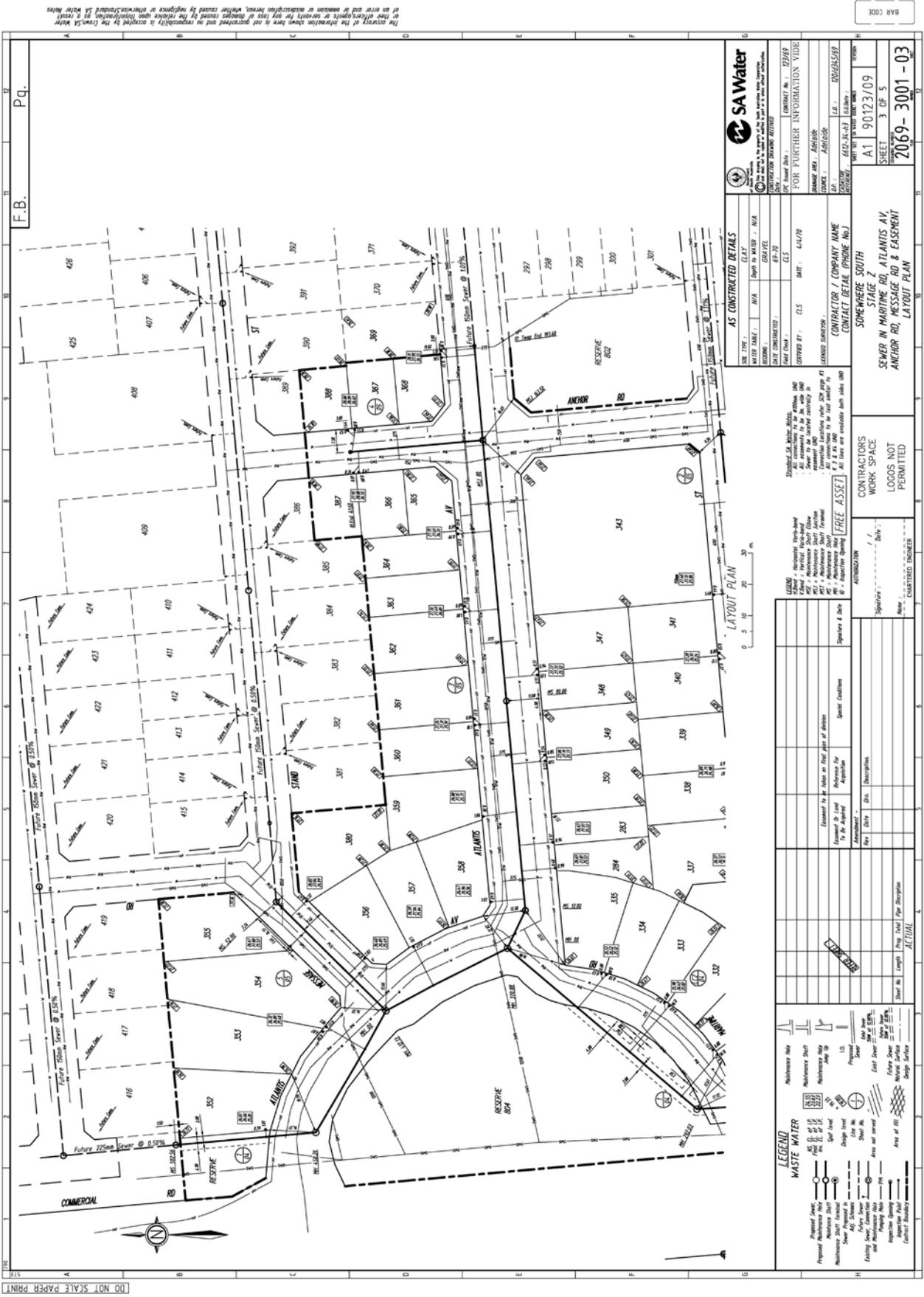
[To be used with WSA 02-2002 V2.3]



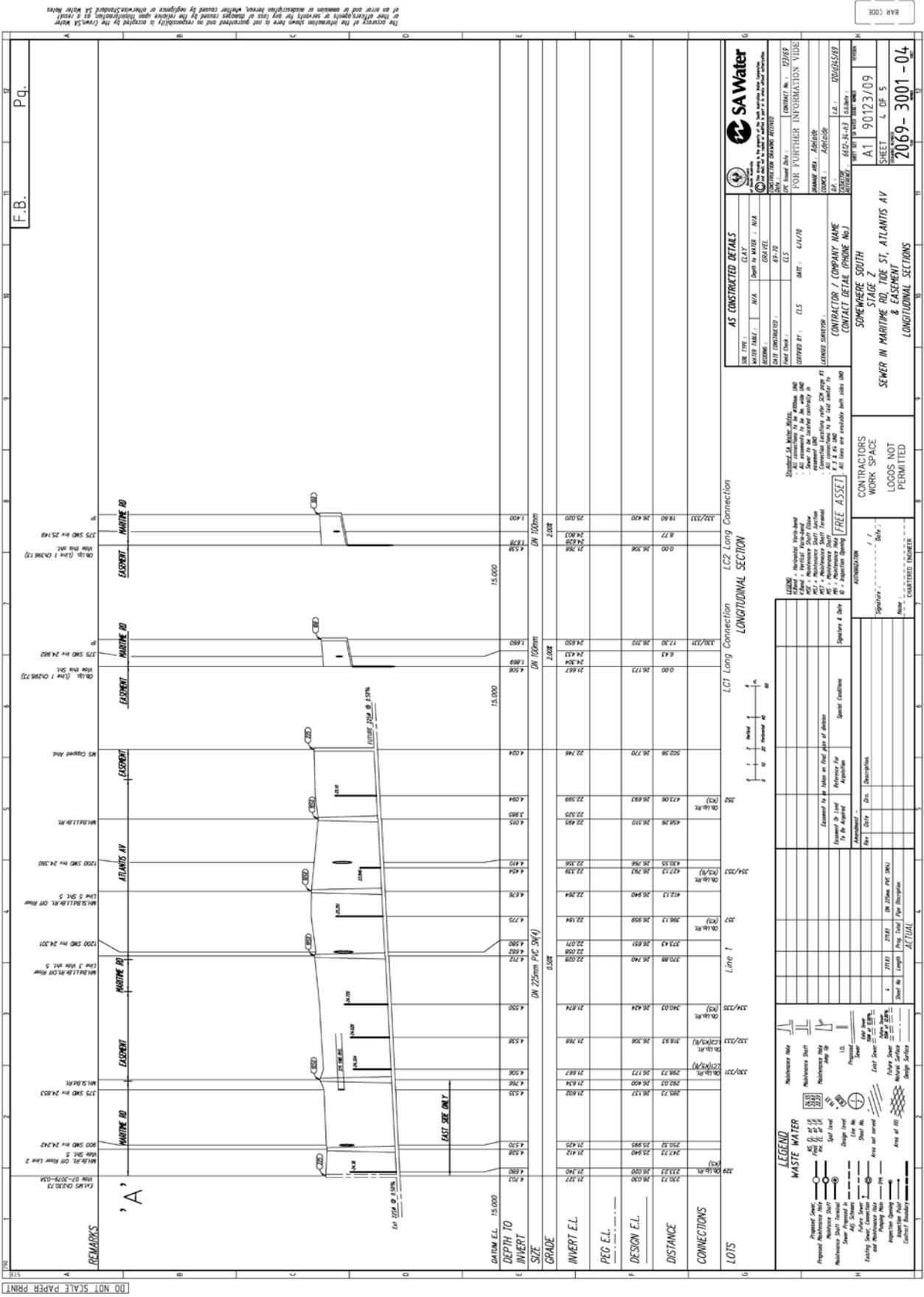
The accuracy of the information shown here is not guaranteed and no responsibility is accepted by the Crown SA Water or their officers, agents or servants for any loss or damage caused by negligence or otherwise. Crown SA Water makes no error and no omission or understatement herein, whether caused by negligence or otherwise. Crown SA Water makes no error and no omission or understatement herein, whether caused by negligence or otherwise. Crown SA Water makes no error and no omission or understatement herein, whether caused by negligence or otherwise. Crown SA Water makes no error and no omission or understatement herein, whether caused by negligence or otherwise.

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REMARKS

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209	31.827</									

Document Update Information

Date	Change Type	Page Number(s)	Details
1 Dec 2009	Revision 1	Various 3 5 7	SA Water contact details changed Training details changed PVC pipe installation details changed Testing details amended
1 Aug 2010	Attachment Added	Attachment	Corrective Action Request form added
June 2013	Revision 4	Various	
March 2014	Revision 5	5	Bored pipes minimum grade included

To be used with WSA 02-2002 V2.3



SA WATER

DEFECT ADVICE SHEET

This form shall be completed by either the Contractor or SA Water Contracts Inspector as soon as the defect or Unauthorised product has been identified.

This form shall be forwarded to :-

INFRASTRUCTURE STANDARDS MANAGER
Level 7, 250 Victoria Square, ADELAIDE S.A.
GPO Box 1751 Adelaide SA 5001
Phone (08) 7424 2009 Fax (08) 7003 2009

REPORTED BY

Contractor / Inspectors Name :

Project and Location :

DEFECT PRODUCT DETAILS

Manufacturers Name :

Suppliers Name (if known) :

Type of Defect found : Tick appropriate box/s

- | | | | |
|------------------------------|--------------------------|----------------------|--------------------------|
| Oversize | <input type="checkbox"/> | Undersize | <input type="checkbox"/> |
| Broken, split or cracked | <input type="checkbox"/> | Unauthorised product | <input type="checkbox"/> |
| Does not meet Specifications | <input type="checkbox"/> | Other | <input type="checkbox"/> |

Brief description of defect :
.....
.....
.....
.....

Sent back for replacement : Yes No

Signed : Date :

CORRECTIVE ACTION REQUEST

A Corrective Action Request form shall be completed by the relevant SA Water Contract Administrator for each incidence where a problem or issue has been identified.

Part 1 DETAILS SECTION

Project and Location

Contractor

Contractors Representative

Issued by Date Issued

Part 2 WHAT IS THE PROBLEM / ISSUE?

.....
.....
.....

Part 3 HOW CAN THE PROBLEM / ISSUE BE RESOLVED?

.....
.....
.....

HOW CAN THE BUSINESS PREVENT THE PROBLEM / ISSUE RE-OCCURRING

.....
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.....

Part 4 HAS THIS PROBLEM / ISSUE BEEN RESOLVED?

Yes

No

Signed : Date :