

**Constructors are required to purchase a copy of the WSAA Vacuum Sewerage Code of Australia (WSA 06 2008-1.2) prior to commencing construction.
A copy is to be available on-site at all times.**

Clause	Description	Requirement	Supporting Document
22.2	Training Requirements	See SA Water requirements	Pt3 – 22.2 (Pg 2)
23.5.3	Disused/redundant sewers	See SA Water requirements	Pt3 – 23.5.3 (Pg 2)
24	Authorised Products and Materials	See also WSA 02/03 Part 2 – Materials comments and SA Water Authorised Products List	Pt3 – 24
33.2	Bedding materials	Vacuum and pumped mains are to be embedded in packing sand which meets the requirements of TS 4	
34.1.4	Polyethylene Pipe	Butt Welding See SA Water requirements	Pt3 – 34.1.3 (Pg 3)
34.9	Marking Tapes	SA Water requires detectable marking tape 300 mm (approx) above the top of all plastic vacuum pipes and associated pressure mains.	
34.10	Valves and Surface Fittings	Only authorised valves, covers and frames as shown in SA Water’s “Authorised Items for Vacuum Sewers” are to be used in SA Water’s infrastructure.	
34.5	Thrust and Anchor Blocks	See SA Water requirements	Pt3 – 34.5 (Pg 4)
34.17	Location Markers	Authorised location markers are required at all valves and scour points	
35.	Collection Chambers & MH	Step Irons and ladders are not required in SA Water’s infrastructure	
37.2	Embedment Material	Unless specified otherwise, embedment shall be authorised Packing Sand in accordance with TS4 or an authorised equivalent.	
38.1	Trench Fill	See SA Water requirements	Pt3 – 38.1 (Pg 4)
38.4	Compaction	See SA Water requirements	Pt3 – 38.4 (Pg 4)
41.3.4	Compaction Testing	See SA Water requirements	Pt3 – 41.3.4 (Pg 4)
41.4	Vacuum Testing	Vacuum sewers are only to be tested using the approved vacuum testing procedure	
44	Work as Constructed	See SA Water requirements	Pt3 – 44 (Pg 5)

Additional Construction Requirements

	Description	Supporting Document
NOTE	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 Contractor’s Federation (CCF) Integrated Management System (IMS).	
AR1	Geotechnical / Shoring Responsibilities	Pt3 – AR2 (Pg 7)
AR2	Issue of Certificate of Practical Completion	Pt3 – AR3 (Pg 9)
AR3	“Notice of Intent” requirements	Pt3 – AR4 (Pg 9)
AR4	Constructor’s indemnity requirements	Pt3 – AR5 (Pg 10)
AR5	Defect Advice Sheet	Pt3 – AR7 (Pg 11)
AR6	Corrective Action Request	Pt3 – AR7 (Pg 12)

To be used with WSA 06-2008 V1.2

SA Water Supplementary Documentation

Vacuum Sewerage Code - Part 3 (Construction)

Related Requirements

Constructors are required to purchase a copy of the WSAA Vacuum Sewerage Code of Australia (WSA 06) prior to commencing construction. A copy is to be available on-site at all times.

Pt 3 – 22.2 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)
PVC pipelaying	One Person (on site during activity)	CivilTrain (CCF)
PE pipelaying	One Person (on site during activity)	TAFE (Regency Park)
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 Slinging Competency	Anyone involved in loading activity (during activity)	To meet OHS Regulations/ CivilTrain (CCF)

Training available at:

CivilTrain - Civil Skills and Technology Centre, 51-53 Magazine Road, Dry Creek 8262 8066
 (CCF - Civil Contractors Federation, 60 Woodville Road Woodville 8244 0922)
 TAFE - Regency College, School of Plumbing Regency Park 8348 4311

Pt 3 – 23.5.3 Disused /Redundant Sewers, (incl Connections and Septic Tanks)

Where an existing 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:

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- 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.

Where an existing septic tank is to be made redundant and the sanitary drain is to be re-connected the following action is to occur:

- The existing septic tank is to remain in operation until the vacuum sewer system and discharge pipework is installed and ready for use.
- Once the vacuum sewer system is ready for operation the property drain is to be disconnected from the septic tank at a suitable point and the pipework is to be reconnected to the property connection/ inspection point adjacent to the pumping sump.
- The property owner should be advised to remove or fill the septic tank to prevent future OH&S issues.

Pt 3 – 24 Authorised Products and Materials

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 Vacuum Sewers” 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/>)

Because the connection point(s) of the vacuum sewer may be into existing sewer system materials, products authorised in the “Authorised Items for Sewer Systems” and if appropriate the “Authorised Items for Water Supply Systems” may be used to facilitate the connection. Any special connection details are to be shown in the Standards Drawings or on the Design Drawings.

Pt 3 – 34.1.3 Polyethylene Pipe - Butt Fusion Welding

Butt fusion welding of PE pipe is not authorised by SA Water unless it is carried out by specifically authorised PE welding specialist. If authorised by SA Water the welding specialist shall comply with the requirements of WSA 01-2004.

Pt 3 –34.5 Thrust and Anchor Blocks

Where PE pipe is used for pressure main there is a requirement to connect directly to a section of PVC sewer using either a flanged or threaded connection, an anchor block is to be provided on the PE main a distance of approximately 1 m from the connection point. This is to prevent expansion or contraction of the PE pipe causing damage to the PVC pipework.

Pt 3 – Section 37 Pipe Embedment and Support

Polyethylene pipe has a high coefficient of linear expansion and therefore shall be cut and installed in a manner which ensures that no stress is placed on the pipe or fitting and which complies with the following:

- Backfilling of the side support and pipe overlay zones (refer SA Water WSCM Drawings Section B) shall not be placed about a PE pipe when the ambient temperature adjacent to the pipe falls outside the range 12-27°C.
- For every metre of measured pipe, the additional length shall be a minimum of 0.18 mm/m/°C above 12°C.
- To disburse the additional length required for thermal contraction, pipes shall, where possible be ‘snaked’ in the trench horizontally.

Pt 3 – 38.1 - Trench Fill

Unless specifically detailed otherwise on the Design Drawings, all materials used in the trench fill zone for vacuum sewers, and the compaction to be achieved in those materials, are to be as detailed in SA Water’s Water Supply Construction Drawings Section B and minimum cover to pipe shall be as shown on VS 1401

Pt 3 – 38.4 – Compaction Testing

Pt 3 –41.3.4 – Compaction Testing

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 Constructor shall be responsible for all compaction testing and shall arrange for the testing to be carried out by a NATA certified Testing Agency. 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 vacuum sewers and connections, there shall be a minimum of one field density test within each one metre depth of trench fill:

- (a) for each 50 metre length of vacuum sewer main trench, and
- (b) in at least 20% of the trenches for vacuum sewer laterals. **Must be in the same project**, or
- (c) as otherwise 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 vacuum sewer mains and by 2 metres for lateral 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:

- 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 vacuum sewer main or collector etc is unsatisfactory. The Constructor shall at the Contactor'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 – Section 44 – Work-As-Constructed Details

A survey check shall be carried out to ensure the location and levels of all newly constructed vacuum sewer systems, including (but not limited to) the main and lateral pipework, Collection Chambers, Maintenance Holes and Maintenance Shafts, valves and valve chambers, access roadways etc, have been constructed in accordance with the Design Drawings and the Vacuum Sewerage Code of Australia.

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 06 Part 1.

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. Asset Documentation as listed in clause 24.1
- b. 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.
- c. 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 (as per the Work as Constructed details as listed in clause 24.2). 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.

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

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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

Vacuum sewer mains and collectors shall be deemed to comply with the Design Drawings if they 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 07 Part 1.

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.

SA Water Supporting Documentation

Vacuum Sewerage Code - Part 3 (Construction)

Additional Requirements

Pt3 – AR1 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.

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.

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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 the Handbook for 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.

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 – AR2 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 vacuum sewers are laid have been fully constructed or repaired.
- (6) All rubbish and foreign matter have been removed from the vacuum sewer mains and collectors.
- (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.

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- (9) All outstanding debts have been paid.
 - (10) The security has been lodged.
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Pt3 – AR3 Notice of Intent

Notification to other Agencies

Where vacuum sewers and property 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.

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 Vacuum Sewers

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/United Water

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/United Water will advise within 7 days if they are able to comply and the required fee.

Pt3 – AR4 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 Vacuum Sewers

Should any tools, debris or foreign matter be left in the vacuum 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.

Pt3 – AR5 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 United Water 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.

Annexures

- Annex A As-Constructed Mains Reporting Data
- Annex B Typical As-Constructed Drawing
- Annex C Document Update Information

Attachments

Defect Advice Sheet

AS-CONSTRUCTED MAINS REPORTING DATA

VACUUM SEWER MAINS

For all pipes provide the following details:

- Material, DN, PN, lining, external coating, jointing method, manufacturer
- Australian Standards pipe identification markings.

EXAMPLE

Typical Australian Standards marking details are shown as follows

PE pipe Manufacturer, DN (as a number only), wall thickness (as a number only), PN,
PE Class and Type (if applicable), Date of manufacture, Factory ID

eg **XYZ Company 90 × 1.6 PE80 Type C 09 02 25 F1**

Copy of Vacuum Sewer As Con Drawing here

To be used with WSA 06-2008 V1.2

Document Update Information

Date	Change Type	Page Number(s)	Details
3 August 2010	Page Added	Attachment	Corrective Action Request Sheet added

To be used with WSA 06-2008 V1.2



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 :-

RETICULATION INFRASTRUCTURE SPECIALIST
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

Part 4 HAS THIS PROBLEM / ISSUE BEEN RESOLVED?

Yes

No

Signed : _____ Date : _____