

# **AS-CONSTRUCTED DRAWING REQUIREMENTS GRAVITY MAINS TECHNICAL INFORMATION SHEET**

The aim of this information sheet is to provide detailed information to Contractors, Consultants, Surveyors and Audit Staff involved in the production and checking of As-Constructed Drawings for SA Water's infrastructure projects. This sheet is applicable to all Gravity Mains (sewer mains) and covers the collection of information and conversion of the Design Drawings into As-Constructed Drawings.

SA Water are recording all relevant details of its sewerage infrastructure on its in-house Geographic Information System (GIS) to allow easy location of infrastructure assets, system modelling, system performance assessment plus pipeline leak history and common fault identification. Because of this the information provided on the As-Constructed Drawings must be clear, easily identified and at a scale that can be easily read.

As-Constructed requirements are detailed in SA Water's Sewer Construction Manual Supplementary Documentation to WSA-02. This is available on the Internet at <http://www.sawater.com.au/NR/rdonlyres/96EDA533-DFE0-45D7-9406-A8B865E2DF06/0/Spt3txtlss4All.pdf> and a copy of the relevant information is included as part of this Information Sheet.

## **Definitions**

- Surveyor** All survey checking is to be carried out by a qualified surveyor (minimum qualification to be a Certificate in Surveying or equivalent).
- Certification** Certification of As-Constructed Drawings shall be done by the Consultant, a Registered Surveyor or other suitably qualified person individually authorised by SA Water.
- Centreline E.L.** The finished surface level (FSL) directly above the centreline of the main. This may be natural surface, road bitumen level or top surface of the access cover as applicable.
- Depth** The calculated distance between the Invert E.L. and the Centreline E.L.

## **Individual Responsibilities**

- Consultant** To produce Design Drawings that include all information necessary for the constructor to install the infrastructure pipework. Copies of the latest electronic versions of the Design Drawings (CAD or equivalent) are to be provided to the person producing the As-Constructed Drawings for conversion to As-Constructed Drawings.
- Contractor** Install the infrastructure in accordance with the Design Drawings and provide the person producing the As-Constructed Drawings with sewer main and ancillary equipment (MH, MS and IO) details as required.
- Surveyor** Confirm that the installed infrastructure is within the specified tolerances and where it does not conform, advise the Contractor and Superintendent to determine what corrective action (if necessary) is required. Check any corrective action carried out. Advise the person producing the As-Constructed

Drawings of any changes required to the information shown on the Design Drawings.

**As-Constructed Drawing Producer** The person producing the As-Constructed Drawings is required to make changes, as required, to an electronic copy (CAD or equivalent) of the latest Design Drawings.

**Superintendent** The Superintendent's Representative is responsible for making a decision on the acceptability of all infrastructure which is not within the required tolerances or where appropriate, determining the requirement for rework. They are also responsible for checking the As-Constructed Drawings for accuracy and completeness.

## Pipework Requirements

The Design Drawings provide a generic description of the type(s) of pipes that can be used for the individual project. The drawings are designed to allow the contractor flexibility (within the constraints of SA Water's Authorised Items List) in the areas of pipe material and the jointing system. The Contractor is required to provide the person producing the As-Constructed Drawing(s) with all relevant information necessary to identify the specific pipe type used. All necessary pipe details are generally marked on the pipe (see Attachments) unless it is pipework, which has been specially ordered and the details will have been provided to the pipe supplier.

SA Water have a requirement to calculate the storage capacity of the main and ancillaries (eg MH, MS etc). To allow these calculations to occur. The As-Constructed Drawings must include:

- Corrected details regarding access structures (eg MH, MS or IO). Details shown in the "Remarks" recording section on the longitudinal section (correct only if different from the original Design Drawing information);
- Nominal Internal Diameter of all MH, MS and IO. The dimension is to be shown on the longitudinal section in a balloon (with leader to the structure) with value shown in millimetres eg 1500, 1200, 1050, 900, 225, 150 etc. (See Typical As-Constructed Drawing in Attachment D);
- Corrected "Invert" level (if different from the original Design Drawing value);
- Corrected "Centreline EL" level (if different from the original Design Drawing value).

It also necessary to check and correctly identify any other special or changed requirements that may have been specified on the Design Drawings eg easements, scours. All relevant details for each of the specified requirements must be included on the As-Constructed Drawing.

If any doubt exists, all available information should be included. If necessary, this information can be included as an attached table with the item number referred to on the As-Constructed Drawing.

## Attachments

- Copy of Annex A to SA Water Supplementary Documentation to WSA 02 Part 1
- Copy of Annex A to SA Water Supplementary Documentation to WSA 02 Part 3
- Copy of Annex B to SA Water Supplementary Documentation to WSA 02 Part 3

## 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 Page 2 of 19) 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.

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.

Symbols to be used on the "As-Constructed Plan" are shown in Attachment A to this document. Additional Pipe, Valve and Ancillary Information, as detailed in Attachment B, are required to be included on the As-Constructed Plan

Examples of completed "Plans" can be found in Attachment C of this document.

### 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 (signature) 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 \* Page 3 of 19 ked 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;
- 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 IP's;
- 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.**

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### **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 below.

### **Construction Accuracy**

#### Horizontal Tolerances

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

- $\pm 500$  mm along the line of the sewer main, and  $\pm 200$  mm perpendicular to the line of the sewer main for Maintenance Holes not located at sewer junctions,
- $\pm 200$  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  $\pm 200$  mm from any side boundary and  $\pm 100$  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

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

### Recording As-Constructed Information and Certification

The surveyor shall mark up the 'ori Page 5 of 19'atest 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.

Details added to the As-Constructed Drawings shall also be in accordance with the following :-

- Attachment A to this document - Symbols to be used on the "As-Constructed Plan";
- Attachment B to this document - "As-Constructed Mains Reporting Data" requirements;
- Attachment C to this document – Typical "As-Constructed Plans and Drawing Templates."

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.

### Recording As-Constructed Information for decommissioned sewer mains

The details of decommissioned sewer mains shall be included in As-Constructed Drawings, identified by the symbols in attachment A of this document and shall include the following;

- What has been decommissioned (e.g. size, material, length, fittings etc);
- Location of where the main has been disconnected;
- Date of when pipe was decommissioned;
- Whether pipe has been removed or is still present.

### Survey Requirements

#### 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 (signature) that the As-Constructed information and Drawings are correct.

These As-Constructed Drawings shall be forwarded to the SA Water Manager responsible for the contract inspection/administration of the project:-

- The Manager, Water and Wastewater Networks - Engineering (250 Victoria Square, Adelaide SA 5000, for contracts within the Adelaide Metropolitan Area and ' Page 5 of 18 urther Metro Areas);
- The Manager, 'SA Water Region' (for contracts within the Regional Areas).

The relevant manager will ensure the information is included on asset management records.

### **SA Water Administered Contracts**

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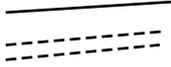
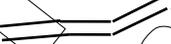
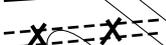
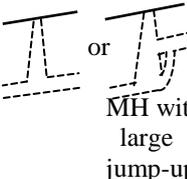
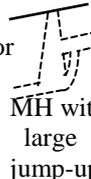
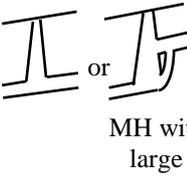
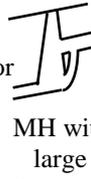
SA Water technical staff shall carry out (or SA water shall arrange for a suitably qualified surveyor to carry out) the As-Constructed survey checks, record all variances and Certify (Signature) that the As-Constructed Drawings are correct. The original As-Constructed Drawings are to be completed by, or forwarded to, SA Water prior to the issue of the Certificate of Practical Completion. SA Water technical staff shall ensure the information is included on asset management records.

### **SA Water's Alliance Partner's Administered Contracts**

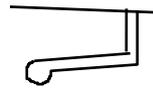
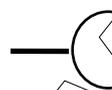
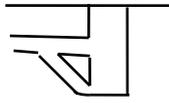
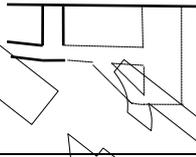
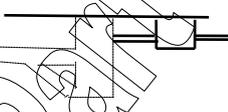
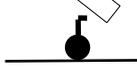
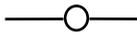
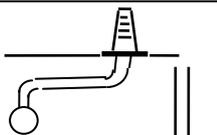
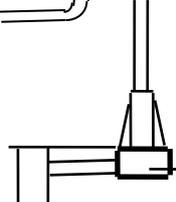
SA Water's Alliance Partner's technical staff shall carry out (or SA Waters Alliance Partner shall arrange for a suitably qualified surveyor to carry out) the As-Constructed survey checks, record all variances and certify (signature) that the As-Constructed Drawings are correct. The certified As-Constructed Drawings are to be completed by, or forwarded to, SA Waters Alliance Partner prior to the issue of the Certificate of Practical Completion. SA Waters Alliance Partner shall forward the information to SA Water for inclusion on asset management records.

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

ITEM	SYMBOLS		SIZE
	PLAN	SECTION	
<b>Sewer Main</b> <ul style="list-style-type: none"> <li>• Existing</li> <li>• Proposed</li> <li>• Future</li> </ul>	150 PVC-U 0.5% FB369p7    	    	0.5 mm  1.0 mm  0.75 mm
<b>Pumping Main</b> <ul style="list-style-type: none"> <li>• Existing</li> <li>• Proposed</li> </ul>	  	  	0.5 mm  0.7 mm
<b>All Mains and Connections</b> <ul style="list-style-type: none"> <li>* Decommissioned</li> </ul>			0.5 mm
<b>Change of Pipe Type</b>			
<b>Change of Grade</b>			
<b>MAINTENANCE STRUCTURES</b> <b>Maintenance Hole (MH) or</b> <b>Maintenance Shaft (MS)</b> <ul style="list-style-type: none"> <li>* Existing</li> <li>* Proposed</li> </ul>	  	 or  MH with large jump-up   or  MH with large jump-up	4 dia  4 dia
<b>Inspection Opening (IO)</b>			2.2 dia

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

ITEM	SYMBOLS		SIZE	
	PLAN	SECTION		
<b>Connections</b>	* Existing			0.25 mm 1.0 dia
	* Proposed			0.5 mm 1.2 dia
<b>Pumping Station (PS)</b>			6 dia	
<b>Control Maintenance Hole (MH)</b>			4 dia	
<b>Valve Chamber (VC)</b>			4 sq	
<b>Stop Valve (SV)</b>		As for Plan	2 eq	
<b>Reflux Valve (RV)</b>		As for Plan	2 eq	
<b>Scour Valve (Sc)</b>		As for Plan	2 dia	
<b>Sewer Air Valve</b> (Similar to Water Supply Fireplug - FPAV)		As for Plan	2 dia	
<b>Vents</b>	* Induct			3 sq
	* Educt			3 dia

**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
<b>DATA INPUT REQUIREMENT</b>	<i>Standard Symbol</i>	<i>Compulsory -Select as required</i>	<i>Example</i>	<i>Compulsory</i>	<i>Compulsory</i>	<i>Informative</i>
Poly Vinyl Chloride (PVC)	PVC	<ul style="list-style-type: none"> <li>Solid Wall (SO)</li> <li>Sandwich (SA)</li> <li>Ribbed (R)</li> </ul>	PVC (R)	✓	✓	AS/NZS 1260
Polyethylene (PE)	PE80	Type A (A)	PE80 (A)	✓	✓	AS 4130
		Type B (B)	PE80 (B)	✓	✓	
		Type C (C)	PE80 (C)	✓	✓	
	PE100	PE100	PE100	✓	✓	AS 4130
<i>The following format is to be used where special, project based, approval has been given for the specific pipe system to be installed.</i>						
Polypropylene eg SewerMAX	PP	<ul style="list-style-type: none"> <li>Manufacturer</li> <li>Tradename</li> </ul>	PP (SewerMAX)	✓	✓	Draft AS/NZS 5065
Acrylonitrile Butadiene Styrene	ABS	<ul style="list-style-type: none"> <li>Manufacturer</li> <li>Tradename</li> </ul>	ABS (Eyrapipe) (SWJ)	✓	✓	AS3518
Glass Reinforced Plastic	GRP	<ul style="list-style-type: none"> <li>Solvent Weld (SWJ)</li> <li>Rubber Ring (RRJ)</li> <li>Manufacturer</li> <li>Tradename</li> </ul>	GRP (4010x)	✓	✓	AS 3571
Concrete	CONC	<ul style="list-style-type: none"> <li>Calcareous Aggregate (C)</li> <li>PVC Lined (PVC)</li> </ul>	CONC (C)	✓	✓	AS 4058
Vitreous Clay	VC	<ul style="list-style-type: none"> <li>Manufacturer</li> <li>Tradename</li> </ul>	VC (Keramo)	✓	x	AS1741

Legend:  
 ✓ Value to be supplied  
 x No information required

**Additional Pipe, Valve and Ancillary Information**

**AS-CONSTRUCTED MAINS REPORTING DATA  
GRAVITY MAINS**

For any pipes other than the above provide the following details:  
Material, DN, PN, lining, external coating, jointing method, manufacturer

Australian Standards pipe identification markings.

**Marking details are shown as follows**

**PVC pipe** Manufacturer, Nominal Size (DN) as a number only, letters "PVC", Letters "DWV", Letters "DWV", Letters "SC" if Sandwich construction, Date of manufacture, Factory ID, Number of Standard  
eg Trade Name **150 PVC DWV SC 04.02.25 F1 AS/NZS 1477**  
**Note:** For PVC pipe the word "Ribbed" is not included in the markings because the ribbing is obvious  
**PE pipe** Manufacturer, DN (as a number only), wall thickness (as a number only), PN, PE Class and Type, Date of manufacture, Factory ID  
eg Trade Name **25 x 1.6 PE80 Type A 04.02.25 F1**

Where Special Pipes are authorised for use

**Polypropylene** Manufacturer, Nominal Size (DN plus size), letters "PP", MFR Class, Type of use eg "Drain", Class of pipe eg SN8, Date of manufacture, Factory ID  
eg Trade Name **150 PP CLASS A DRAIN SN8 04.02.25 P1**  
**ABS Pipe** Manufacturer, Pipe Series, Pipe material, DN, Pressure Class (PN), Angle of deflection at socket, Date of manufacture, Factory ID

eg Trade Name **S1 ABS 160 DN450 PN16 3° 04.02.25 P1**  
**GRP pipe** Manufacturer, DN (as a number only), PN, Stiffness Class (SN), Words "NOT FOR POTABLE WATER" if applicable, Date of manufacture, Factory ID  
eg Trade Name **200 SN 5000 NOT FOR POTABLE WATER 04.02.25 F1**

**For Sewer Rising Mains use the pipe descriptions shown in the Pressure Mains (Water Supply) As-Constructed information**









# Typical As-Constructed Plan

