



Pressure Sewerage Systems Technical Specification

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Revision details

Version No.	Clause	Description of revision
1.0	N/A	Original Issue

Foreword

This Specification is for the design, supply and construction of Pressure Sewer Reticulation Systems owned by Sydney Water. On-Property Works undertaken by the dwelling builder, which includes sanitary plumbing, conduits and draw wires for the electrical and control cabling, are not included in this document.

Sydney Water makes no warranties, express or implied, that compliance with the contents of this Specification shall be sufficient to ensure safe systems or work or operation.

It is the user's sole responsibility to ensure that the copy of the Specification is the current version as in use by Sydney Water.

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Acronyms

Acronym	Definition
PSS	Pressure Sewerage Systems

General Terms & Definitions

Term	Definition
Contractor	Sydney Water listed Contractors with Pressure Sewer System capability
Sydney Water	Sydney Water including the nominated person or organisation that has written authority to act on Sydney Water's behalf
Supplier	The person or organisation responsible for the fabrication or manufacture and supply of products, materials, equipment and components described herein.
WSAA Codes	Code of Practice issued by Water Services Association of Australia
WSAA Code – Sydney Water Edition	WSAA Code with modifications by Sydney Water for use in Sydney Water assets, when available.

1. Introduction

1.1 Scope

This Specification shall be read in conjunction with Sydney Water Technical Specification – Civil, Mechanical and Electrical. It covers the minimum requirements for design, supply and installation of pressure sewerage infrastructure owned by Sydney Water. Where discrepancies are found, Sydney Water Technical Specification – Civil, Mechanical and Electrical shall take precedence.

This Specification is not intended to be a stand-alone document. Any project specific documents and additional technical clauses must be included with contract documentation.

1.2 References

The following codes and documents are directly applicable to the works described herein and are listed for convenience. The list is not exhaustive, and it does not relieve the Designer and Contractor from federal, state, and local regulations that may apply. The works shall be in accordance with the latest editions of the following codes, standards, and reference documents. Where discrepancies between reference documents and this specification are found, the contractor shall refer these to Sydney Water.

WSAA Codes and Sydney Water Supplements

- WSA 01 Polyethylene Code of Australia
- WSA 07 Pressure Sewerage Code of Australia
- Sydney Water's Supplement to WSA 07
- WSA 02 Sewerage Code of Australia (Sydney Water Edition)
- WSA 201 Manual for Selection and Application of Protective Coatings
- Sydney Water's Supplement to the WSA 201

Relevant Australian Standards and WSSA Product Specifications

Sydney Water Standards, Specifications and Procedures

- Sydney Water Technical Specification – Civil, Mechanical, Electrical
- Sydney Water Critical Safety Standards
- Sydney Water Management Specification
- EPS 500 - Engineering Product Specification for Standard Pipes and Fittings for Networks
- EPS 501 - List of Approved Non-Standard Products for Networks
- Sydney Water Odour Control Unit Specification
- Sydney Water Ventshaft Guidelines
- Sydney Water Commissioning Specification
- Sydney Water Maintenance Specification
- PSS Procedure – Connections and Extensions
- Instructions to Water Service Co-Ordinators – Major Works
- Instructions to Designers – Major Works
- Instructions to Contractors – Major Works

- Sydney Water Shared Purchasing Agreements

Miscellaneous

- NSW Services and Installation Rules
- Supply Rules of the Electrical Supply Authority

2. General

2.1 Proprietary Items

Nomination of a proprietary item by Sydney Water does not imply preference or exclusivity for the item identified. Substitution of specified on-property equipment is not acceptable.

Alternatives that are equivalent to the nominated items can be submitted to Sydney Water for acceptance. The submission must include appropriate technical information, samples, calculations, and the reasons for the proposed substitution, as appropriate.

2.2 Planning Matters, Authorities Compliance, Permits & Fees

The Contractor shall obtain all necessary permits and/or approvals from responsible Authorities to undertake the Works of this Contract.

Where the Contractor is required under any Act or under any ordinance, regulation, by-law, order or proclamation under an Act or is required by a person acting in the exercise of statutory powers, to obtain a written approval to carry out any work under the Contract, then a copy of that approval shall be given to Sydney Water within 5 days of the receipt by the Contractor of such approval.

2.3 Site Security

The site is to be treated as open public space, and precautionary measures shall be taken for public safety, including storage of equipment and access to the collection tank(s).

The Contractor's Workplace Health & Safety Plan shall address public safety and ensure appropriate measures are taken to ensure a safe work site.

2.4 Services

Details of services shown on the Contract Drawings are not to be taken as indicating all existing services or exact locations. Verify the exact location of all services which may be affected by construction activities, and positively locate, in the field, all services impacted by excavation works prior to commencing. The services investigated shall include, but not limited to, power, communication, gas, water, sewer, and stormwater.

All services shall be located and marked out on the ground with appropriately coloured survey paint.

Pot holing shall be required for positive identification of sensitive areas including, but not limited to, buried fibre optic and power transmission infrastructure, as well as any locations identified by Sydney Water.

Notify the owner of any services that may be affected by construction activities in accordance with the notification requirements of the particular service owner. Adhere to the Service Owners instructions for work and reporting requirements.

Protect and maintain existing services to the satisfaction of the Service Owner including, if necessary, relocation, temporary diversion, or support of the service. The minimum clearance requirements of the proposed pipelines to existing or proposed services shall be as specified in WSA 07 – 2007 and Sydney Water's Supplement to WSA-07 (Clause 3.12 and Table 3.1).

In the case of high risk assets (Optic Fibre telecommunications cables, oil or gas lines, etc), the clearance requirements are to be added to project specific specification and the design drawings by the Designer where they differ from the requirements of WSA-07.

If a service is damaged during excavation work, arrange, or perform repairs to the satisfaction of the Service Owner. The cost of repair, relocation, or verification on any operating underground service identified in the design drawings is to be borne by the Contractor.

2.5 Site Contamination

If there are any potential risks to future construction, operation and maintenance personnel from remaining contamination around infrastructure, Property Environmental Services in Sydney Water shall be consulted, and the required risk notification applied as per SWEMS0186.02 – Contamination Incident Disclosure Form.

2.6 Acid Sulphate Soils

Where there is the potential for acid sulphate soils, the contractor shall prepare an acid sulphate soil management plan as part of their Environmental Management Plan (EMP). The requirements of the EMP are to be incorporated into the construction methodology as required.

2.7 Materials and Workmanship

All equipment, materials and accessories used in this contract shall be new, conform to the appropriate current Australian Standard and comply with Sydney Water's approved products requirements.

All materials are to be transported, handled, and stored in accordance with the manufacturers' recommendations and in a manner that prevents damage or deterioration. All products and materials are to be inspected by the Contractor at the time of delivery for damage and/or excessive distortion.

2.7.1 Pipes and Fittings

Polyethylene pipes are to be PE100, PN16 and fittings shall be PN16 unless a higher class is specified. All PE pipe shall be manufactured in accordance with AS/NZS 4130 – Polyethylene Pipes for Pressure Applications. All PE fittings for polyethylene pipes shall be manufactured in accordance with AS/NZS 4129 - Fittings for Polyethylene Pipes for Pressure Applications. Installation shall be in accordance with AS/NZS 2033 - Installation of Polyethylene Pipe Systems and AS/NZS2566.2 – Buried Flexible Pipelines – Installation.

Only black polyethylene pipe with a cream stripe as detailed in Sydney Water's Supplement to WSA-07-2007 shall be used for pressure sewerage system applications. Any black pipes with other coloured stripe are not to be used under any circumstances. Mains laid with another coloured stripe on them will not be accepted at handover.

Joining of polyethylene fittings shall be either electro fusion or butt welding. All manufacturers recommended jointing procedures must be adhered to.

Segments of pipe having cuts or gouges in excess of 10% of the wall thickness of the pipe shall be cut out and removed. The undamaged portions of the pipe shall be re-joined using the electrofusion joining method. Sections of polyethylene pipe shall be joined into continuous lengths on the job site and above ground.

2.7.2 Metallic and Plastic Flanges

All flanges shall be minimum PN16, comply with AS4087 and used to connect pipework (50mm diameter and larger) to fittings including valves so that all valves can be easily removed and maintained. All flange bolts shall be minimum grade 316 stainless steel with "never seize" applied to all threads. All metallic and plastic flanges DN100 or greater are to be connected in accordance with Sydney Water's Technical

Specification – Mechanical. Plastic flanges and gaskets are to comply with AS/NZS 4129 and WSA-109 respectively.

2.7.3 Pipes Joints

Refer to Sydney Water Technical Specifications – Civil for polyethylene pipe joints. Electrofusion, butt welding and flanged connections are all acceptable methods of joining polyethylene pipe.

The use of compression fittings shall be kept to a minimum, and only to be used for on-property works. Permissible locations for these fittings are where the property discharge line connects to the threaded BSP fitting on the external face of the collection tank wall and on the upstream side of the property boundary assembly. The pressure rating of the fittings shall be PN16 as a minimum, or to match the class of the associated pipework. The fittings shall be installed and tightened to the manufacturers' recommendations.

For pipe sizes up to and including DN90, joints are to be of electrofusion type complying with AS/NZS 4129, or flanged connections. For sizes greater than DN90, butt-welding may also be used. Where butt-welding is used, the internal weld bead shall be removed. Transition between sizes shall be made using tapered connections.

All welding shall be undertaken by trained and certified welders in accordance with WSA 01-2004 Clause 5.2 and the manufacturer's welding requirements and recommendations. Training courses shall be Plastic Industry Pipe Association (PIPA) approved. Test welds shall be conducted at the commencement of the works and at frequent intervals throughout the works for both electrofusion welding and butt welding to confirm both weld procedures and personnel.

All equipment such as electrofusion jointing machines shall be correctly calibrated with appropriate current certification. These calibration certificates shall be provided to Sydney Water each month.

Sydney Water will inspect quality of welds and witness the welding processes from time to time. Defective welds, if discovered, may lead to uncovering of pipes and a re-inspection of all welds at the Contractor's cost.

2.7.4 Capping Off

During pipe laying, all open ends of pipes shall be capped off to prevent entry of foreign matter into the pipework. This must occur at the end of each day and/ or during inclement weather conditions and/ or where there is a likelihood of water charged soils entering the pipe during periods of non-work.

2.8 Restoration

Restoration works shall be completed to the satisfaction of Sydney Water. A signed acceptance letter from the relevant property owner's confirming satisfactory restoration shall also be obtained and included in the Work As Executed package.

Restoration work shall ensure that the impacted areas are restored to a state equal to or better than, the original existing condition.

3. Construction Methods

Open trench excavation and/ or horizontal directional drilling can be used to install the pipework. The method of installation shall be submitted to and approved by Sydney Water /Designer prior to commencement of any work.

3.1 Open Trench Construction

3.1.1 Trench Details

Pipe trenches shall not be excavated using a chain-trencher unless a minimum trench width of 150 mm is maintained.

For small diameter (DN40) property pipework connections where pipes are laid in a trench rather than installed using trenchless techniques, the installation methodology is set out below:

- Excavate 150mm wide trench using a chain trencher.
- Place bedding and lay pipe. Using a 150mm wide trench and a DN40 PN16 PE100 pipe which has an external diameter of 40mm, the horizontal distance between the pipe and the side wall of the trench would be $(150-40)/2 = 55\text{mm}$.
- Backfill with compaction sand in accordance with WSA PS-350 to sides of pipe and compact using handheld 'horseshoe' tamper that allows compaction of the fill on both sides of the pipe to be carried out simultaneously.
- Backfill to minimum required overlay of pipe crown with compaction sand and compact using handheld tamper across entire width of trench.
- Backfill to underside of topsoil level with trench fill and compact using petrol powered rammer with modified narrow foot to complete compaction.

3.1.2 Bedding of Pipes

Bedding of the pipes shall be undertaken in accordance with WSA 07 Clause 17 and Drawing PSS 1000-V or PSS 1001-V.

3.1.3 Pipe Embedment Material

Pipe embedment shall be compaction sand complying with the WSAA Purchase Specification WSA- PS-350 Compaction Sand or processed aggregate complying with WSAA Purchase Specification WSA-PS-351 and shall be compacted in accordance with WSA 07 – Clause 21.3.2, Table 21.1 of WSA 07. Clause 21.3.2 and Table 21.1.

3.1.4 Trench Fill Material

Trench fill material and compaction shall comply with WSA 07 Clause 20.1 and Sydney Water's Supplement to WSA-07 Drawing PSS 1001-V.

In water charged ground conditions, keep all dewatering systems operating during backfilling so that no fill material is placed or compacted under water. At all times ensure that the pipes are not damaged or moved during placement and compaction of fill.

Where the pipe is supported on concrete or is concrete encased, do not place overlay material until the concrete has attained its initial set and a minimum of 24 hours after pouring.

Where a pipeline crosses a road, a watercourse or is under the control of another Authority, the trench will be backfilled to comply with the requirements of the relevant Authority.

3.1.5 Pipe Bends

Unless specified otherwise, 90-degree bends shall not be permitted. If unavoidable, 90-degree bends shall be accomplished by installing two 45-degree bends with a separation of 300 mm, or by installing a long radius bend.

Bends are not to be achieved by utilising multiple butt welds.

Where curvature of the pipe is to be achieved by cold bending, cold bend the pipe with a uniform radius along the length of the pipe in accordance with manufacturer's instructions. Do not exceed bending radii specified in the Plastics Industry Association of Australia Limited POP202 – 'PVC, PP, and PE Pipe Installation on Curved Alignments'. Under no circumstances is the curvature of a pipe to be more than 25 times the outside diameter of the pipe.

3.1.6 Pipeline Tracer Tape

Pipelines installed by open trench excavation shall use Sydney Water approved detectable marking tape with 316 stainless steel tracer wire in accordance with WSA-318.

The tape shall be placed in the trench on top of the embedment material. Bare wires from the tape are to be connected by a 316 SS 'U Clamp' to the next available termination feature. Splicing of two ends of tracer wire by hand twisting alone, or "twitching," shall not be acceptable under any circumstances. Termination points for the tracer wire shall be located at in-line fittings and features such as isolation valves, air valves, flushing points, pressure sewer pumping unit, the property boundary assembly, etc. and shall be readily accessible at these points such as to allow energising of the tracer wire for location purposes.

3.1.7 Anchorage of the Pressure Main

Anchorage of the pressure mains at bends and changes of direction (if required) shall be constructed in accordance with the design drawings.

3.1.8 Pipe Protection

In order to protect the works from damage or vandalism the following guidelines shall be adhered to:

- No trench shall be left open overnight.
- The minimum possible length of trench shall be left open at any time with the trench backfilled once the pipeline is laid and any lateral spurs cut in.
- Where it is desirable to leave open a key point for subsequent installation of other material etc., these shall be provided with covers that prevent entry from members of the public.

3.1.9 Compaction requirements and Testing

Compaction testing shall be undertaken by a Sydney Water listed Field Tester. The location, depth and number of tests required are to be determined by the field tester, however the minimum number and general requirements will be as detailed in the design drawings.

3.2 Horizontal Directional Drilling

Horizontal directional drilling shall be undertaken in accordance with the requirements of Sydney Water's Technical Specification - Civil.

Polyethylene pipes and fittings shall be used for all boring locations. They shall be of sufficient strength to be used in boring without any short or long-term effect on the material to maintain the manufacturer's full product warranty. Unless specified otherwise, no joints are to be installed in a bore. If this is unavoidable the section of pipe shall be tested, above ground, in accordance with this specification prior to inserting into the bore hole.

Electrofusion welding will only be permitted if it can be demonstrated that deformations of the pipe are within the allowable range to allow for electrofusion welding.

3.3 Connection to Existing System

The Contractor shall comply with the Sydney Water Technical Specification – Civil, Critical Safety Standards, and Sydney Water's Asset Creation Developer Process – Instruction to Contractors-Major Works.

3.3.1 Connection to Existing Pressure Sewers

Only Sydney Water listed Drillers will be approved to undertake live connections to pressure sewer mains.

All tapings shall be clean with no damage to the surrounding structures.

To connect into existing main, wet tapping via branch saddle with an offtake size min DN40 shall be used. The branch saddle shall be an electrofusion polyethylene fitting with a Tee connection to the side of the main (90 degree bends or connections to the top of main are not acceptable). An isolating valve shall also be located on the branch line at no more than 400mm from the Tee connection.

All electrofusion weld shall be pressure tested prior to tapping into the pipe. For property discharge lines, installation must be complete prior to pressure testing. This includes the installation of the collection tank, the property discharge line, the boundary assembly and the connection to the reticulation line (without the tapping). Only after the pressure testing has passed, can the final tapping into the reticulation main proceed.

Tapping of the main will be undertaken by drilling through the open bore of the isolation valve using an appropriate tapping machine/tool ensuring that there is no discharge from the receiving pipe. Ensure a clean hole is made through the receiving pipe to form the connection and there is no damage to the receiving main.

Where branch saddle for DN50 is not available, the main shall be cut in with an electrofusion tee with an offtake size min DN40. Alternatively, if main cannot be isolated, squeeze-off method as per WSA07 and WSA01 is acceptable.

3.3.2 Connection to Gravity Mains

The pressure sewer shall discharge to the gravity mains via a discharge maintenance hole. The discharge maintenance hole lid is to be sealed by means of a bolt down cover.

Protection of the discharge maintenance hole and the following two downstream maintenance holes from corrosive gases is to be achieved by lining the maintenance hole (including cover) with a protective surface coating complying with WSA 201 Manual for Selection and Application of Protective Coatings and Sydney Water's Supplement to WSA 201. Preparation of the surface and application of the coating is to be

undertaken by appropriately qualified and experienced personnel, and in strict accordance with the coating manufacturer's instructions.

A vent shaft shall be constructed at discharge maintenance hole where the diameter of the incoming pressure sewer is DN75 or larger. Vent shafts shall have a diameter equal to the diameter of the outgoing gravity sewer they ventilate, up to a maximum vent size of DN 300. The vent shall be in accordance with the requirements of Clause 7.5.2 of WSA-02 Sewerage Code of Australia – Sydney Water Edition 2017 V4.

4. Pressure Sewer Reticulation Network

4.1 Pressure Sewer Reticulation Pipes

The pressure sewer reticulation pipes shall, where possible, be placed in Sydney Water's services allocation in accordance with WAT-1151-S and WAT-1152-. Distances from other services shall be in accordance with Sydney Water's Supplement to WSA 07 Clause 3.12.4 and Table 3.1. Services shall cross at 90 degrees if practical, but not less than 45 degrees.

Minimum pipe cover shall be in accordance with Drawing PSS-1000-V.

Pressure sewers must be installed to provide continual rise to the air valve locations.

Collection system branches are to be made using electro fusion 45° junctions and long radius electro fusion 45° bends.

4.2 Pressure Sewer Lateral

Pressure sewer lateral shall connect perpendicularly to the pressure sewer reticulation main with electro fusion tees.

4.3 Pressure Sewer Appurtenances

4.3.1 Isolation Valves

Refer to Sydney Water's Technical Specification – Mechanical for requirements.

All valves of any particular type shall be obtained from the same manufacturer. Valves shall be rated to 1,600kPa with valves greater than DN63 resilient seated. Valves located in ground are to be installed with a cast iron surface box and concrete (or recycled plastic) surround with a PVC riser pipe to surface level.

All isolation valves (other than for individual property connections) shall be fusion bonded epoxy coated and suitable for sewage application. Isolation valves are to be either flanged or factory fitted with PE stub pipe ends.

All isolation valves shall be installed complete with permanent tags indicating the direction of closing. Direction of closing for all valves are:

- Valves DN65 and smaller close in clockwise direction
- Valves greater than DN65 close in anti-clockwise direction

All isolation valves shall be buried, with surface fittings in accordance with WSA 07 and drawing PSS-1005-V. Isolation valves are to be installed generally at a maximum depth of 800mm measured from the finished surface level. Install extension spindle to 50mm below underside of surface box where depth from surface to top of valve exceeds 350mm.

All isolation valves shall be fitted with orange spindle caps and surface fittings within the pressure sewer system painted orange with suitable road marking paint.

Valves with PE pipe fittings shall be assembled at least one day prior to installation. At the time of assembly, the valve shall be tightened to its limit, and then tightened again at the time of installation (at least one day later), as both the rubber gasket and the polyethylene in the isolation valve units have been observed to relax over time.

Prior to installation and final tightening, valve units must be taken out of direct sunlight for at least 30 minutes to avoid compromising the integrity of the seal due to expansion and contraction of the valve unit.

4.3.2 Flushing Points

Flushing points shall consist of SS316 pipe and valving housed in a polyethylene pit with Class D frame and solid cover. Flushing points shall not be located within roadways. A typical arrangement is detailed on Drawing PSS-1007-V.

4.3.3 Manual Air Valves

Manual air valves consist of an equal tee connection to the pressure sewer reticulation main with a vertical riser to a surface fitting. All fittings shall be grade 316 stainless steel. The manual air valve shall be located in a pit similar to those used for flushing points. Flushing pits with pressure gauge connections may be used for manual air valves where appropriate. Adequate clearance around any part of the valve to the nearest point of the pit shall be provided to permit operation of the valve. The manual air valve will be no greater than DN25 and will have a discharge pipe directed downward towards the floor of the pit.

4.3.4 Automatic Air Release / Anti-vacuum Valves

Automatic air release / anti-vacuum valves shall comply with Sydney Water's Technical Specification-Mechanical.

4.3.5 Vent Shafts and Odour Control Units

Vent shafts are required at all automatic air valve locations. Vent shafts shall comply with WSA 201, Sydney Water's Supplements to WSA 201 and WSA 07 as well as Sydney Water's Ventshaft Guideline.

Where odour treatment is required prior discharge, suitably sized carbon canisters with interconnecting pipework between the air valve, canister and a vent shaft shall be provided. Refer to Sydney Water's Odour Control Unit Specification for requirements on carbon canisters.

4.3.6 Flowmeters

Flowmeters shall be electromagnetic type and suitable for untreated macerated sewage. Their details and locations shall be indicated on the design drawings. The flowmeter shall be either an ABB Watermaster or Siemens.

The equipment must meet the following criteria:

- 24V DC power supply for schemes that have IICATS monitoring and control – refer to IICATS Standards TOG – TS01.
- Battery operated for standard schemes with no monitoring and control
- 316 Stainless Steel Grounding Rings (2 off) - NOT earth electrode
 - The design of the grounding rings shall be such that the relevant flange and pipe standards are not compromised when the grounding rings are installed
- Full Local Operator Interface Keypad with backlit LCD display – minimum two (2) lines, minimum twelve (12) characters per line, with user configurable display.
- IP67 Electronics Housing (transmitter/converter)
- IP68 Electromagnetic tube and Electrode Housing

- Measurement, totalising and counting of flow in forward and reverse direction
- Analogue output at 4-20mA, and two configurable digital outputs
- Modbus communications protocol ready

PC Connection via USB or Ethernet allowing download of configuration and data logs, as well as firmware/software updates.

4.3.7 Pressure Monitoring Pits

Pressure monitoring pit locations shall be indicated on the design drawings. The standard flushing point provides a connection point for pressure monitoring. Refer Drawing PSS-1007-V.

Permanent or temporary pressure transmitters may be installed at strategic locations in the network as referenced on the design drawings. Where required, these transmitters and their installation shall be in accordance with Sydney Water's Instrumentation and Control Standards TOG-TS01.

4.3.8 Indicator Plates

Indicator plates for isolation valves, air valves and flushing points shall be installed in accordance with WSA-07 and Drawing PSS-1050-S.

4.3.9 Traffolyte Tags

Traffolyte tags shall be installed on the underside of the surface fitting covers and be affixed with a secure fastener as detailed in PSS-1005-V.

4.4 Inspection and Testing

4.4.1 Compaction Testing

Records of the compaction testing shall be submitted to Sydney Water prior to acceptance and handover to Sydney Water.

Soil testing shall be undertaken by a Sydney Water listed Field Tester. All test results are to be provided using appropriate Sydney Water templates in accordance with the Asset Developer Creation Process.

4.4.2 Pressure Testing

Pressure testing shall be performed by Sydney Water listed Field Testers with appropriate expertise.

All pressure testing of the pressure sewerage mains shall conform to WSA 07-2007 Pressure Sewerage Code and Sydney Water's Supplement – Clause 21.4, 21.4.2, 21.5, 21.6, 21.7 and 21.8 and as follows:

- Hydrostatic tests are to be performed progressively. The pressure sewerage main and branch pipes are to be hydrostatically tested at a pressure of not less than 1,600kPa.
- It is not necessary for welded joints to be left exposed on a buried installation. However, flanged, and mechanical joints shall be left exposed to enable visual inspection during hydrostatic testing. If, at any stage during the hydrostatic testing, a leak is detected, all flanged/mechanical joints shall be inspected. If these are found to be satisfactory then inspection of the welded joints is required. Hydrostatic testing each section of pipework is a required inspection hold point.
- To allow the release of air while filling the pipe with test water the installation of a test manual air release valve will be required at local high points. The Contractor will be required to determine the location of the

above based upon construction staging, test sections and local high point locations. Other appurtenances may also be used such as boundary assembly test tees and network air valves.

- Prior to testing, the entire polyethylene pipeline shall be checked to ensure all debris and construction materials are removed from within the pipes and fittings. Where thermal fusion jointing has been used, no testing shall take place until the joints have completely cooled to ambient temperature.
- When pressure testing, introduce the test water slowly into the pipeline, until all air is purged out of the line and water flows freely at the other end of the line.
- The pressure testing shall be considered satisfactory if:
 - There is no failure of any pipe, fitting, valve, joint or any other pipeline component during the pressure test.
 - There is no visual leakage during the test.
 - Maximum allowable losses are within the limits stated in the Code.

All test results are to be recorded on Sydney Water templates as per the Asset Developer Creation Process and submitted to Sydney Water.

4.5 Flushing of System

All pressure sewer mains are to be flushed with water so that all foreign matter is removed from inside the pipe prior to being placed into operation. After the system has been tested and prior to the system being placed into operation each section of pipe work shall be flushed with clean water, at a minimum velocity of 1.0 m/s for a period of time sufficient to change the water in the pipe 2 times.

Record the volume of water flushed, the flushing technique adopted and submit to Sydney Water for approval.

4.6 Work As Executed Information

Drawings are to comply with WSA 02 Sewerage Code of Australia (Sydney Water Edition) Appendix SW 3 and Sydney Water's 'Computer Aided Drafting CAD Standard for Engineering Drawings.

5. On-property Works – Civil

The on-property works include installation of the following:

- Pressure sewer collection tank and sanitary sewer connection pipework (i.e. stub pipe or riser pipe-both to be capped and sealed).
- Property discharge line
- Property boundary assembly

Any changes required by the Contractor, property owner, or their approved representative must be approved by Sydney Water. The owner's representative's identity must be communicated in writing, by the property owners before approval can be granted.

All underground household services in the vicinity of the construction areas shall be located. This includes any existing sanitary lines, storm water, water supply, electrical, telecommunications and gas.

5.1 Collection Tank

5.1.1 General

Collection tanks shall comply with AS/NZS 1546.1, WSA-129 and have NSW Health accreditation and installed by Sydney Water approved Contractor.

Details of the collection tank type (manufacturer, size and specification) shall be specified on the design drawings.

The collection tank shall be installed in accordance with the manufacturers recommended installation instructions, WSA-07 and Sydney Water's Supplement to WSA-07. Min 75mm thick gravel bedding shall be placed under tank.

The tank must not be dropped or rolled at any point during the shipping, unloading, storing, or installation process. The tank material may be sensitive to ultraviolet radiation and must be protected from sunlight during storage and after installation. Tanks shall be covered during storage and only be stored in sunlight for short durations. Only the lids shall be exposed after installation.

The collection tank shall be filled to the inlet pipe invert level with water, prior to pouring the concrete anchor to prevent the tank from "floating" before the concrete sets. Ensure lid is on tank before pouring concrete or backfilling hole. Details of the concrete anchors shall be specified on the design drawings.

5.1.2 Materials

The tank shall be constructed from either HDPE or LDPE. All metalwork and fasteners within the tank shall be stainless steel Grade 316.

In bushfire prone areas the tank lid shall be constructed in, or encased in, a more fire-resistant material. Details of the lid design and materials shall be specified on the design drawings.

5.1.3 Tank Construction

The tank depth shall be sufficient to allow drainage pipes to be connected without backup in the pipe during normal operation.

The tanks must be designed appropriately with provisions for lifting and moving such as lifting lugs to allow installation using small lifting equipment in areas of minimal access for construction equipment.

The tanks shall be shaped and ribbed to bond well with any concrete or other backfill material.

The tanks shall be of leak-proof design using proven materials and manufacturing techniques with a design service life of not less than 100 years.

The tank floor shall be suitably benched to allow a minimum retention at pump cut-out, and to assist in solids removal.

The tanks, including lids, shall be designed to withstand a 500 kg live load from a slow-moving vehicle.

The tank lid shall be environmental green in colour, lightweight (one person lift), lockable and secured to the tank body in such a way that it cannot be removed without special tools. Removal of the lid from the tank shall give easy access to the pumps and associated equipment.

Except for the pump connection point, the pump shall be able to be removed and reinstalled without the need to dismantle any other equipment or risk damaging any other equipment during the process. It shall be possible to properly reinstall the pumps while the tank is near full, but below the level of the pump connection point.

The pump connection points shall be located as high as possible, and in an easily accessible location.

Each tank shall be identified with a unique serial number. The number shall be:

- permanently inscribed onto the tank at the time of manufacture
- located in a position that can be read after installation

The collection tank shall have a 'burial line' mark embossed on the external wall minimum 150mm from the top of the tank.

5.1.4 Tank Inlet

The tank shall be delivered as a complete pre-fabricated unit, complete with all connection accessories including factory connected stubs for the discharge pipe and electrical conduits. The gravity inlet connection stub pipe shall be site fitted in accordance with the manufacturer's installation instructions, extend no more than 90mm into tank and be located above the alarm level. It shall be PVC pipe (SN8) and have the same diameter as the property sanitary line, but as a minimum 100mm nominal diameter.

All penetrations shall be factory sealed with a watertight seal through the tank wall, including electrical conduits (minimum 2 x DN25), to ensure there is no leakage of groundwater into the tank. The tank penetrations shall be sealed on the exterior of the tank with water-repellent silicon sealant, in addition to the manufacturer's requirements, to prevent groundwater infiltration.

The gravity inlet connection pipework shall have solvent-welded joints and comply with the Plumbing Code of Australia (AS/NZS 3500.2:2003, Part 2: Sanitary Plumbing and Drainage). The gravity inlet connection pipework shall be installed at the same time as the collection tank. The inlet pipe must be securely and firmly supported with stabilized sand (refer WSA PS-352) to ensure no deflection occurs at the inlet pipe/tank interface.

5.2 Property Discharge Line

The property discharge line shall be installed without joints between the collection tank and the property boundary assembly unless a significant bend is required.

Property discharge lines differ in diameter depending on the type of pumping unit configuration used. For single and duplex pressure sewer pumping units, the discharge and service line diameters shall be DN40 (32 mm I.D). For units larger than duplex, refer to the property specific design drawings.

Minimum pipe cover shall be in accordance with Drawing PSS-1000-V. Minimum pipe cover could be reduced to 300mm with mechanical protection when in rock. Mechanical protection entails minimum PN16 PVC or PN16 PE100 conduit with minimum 50mm annular clearance.

5.3 Property Boundary Assembly

Property boundary assembly shall include an isolation ball valve, swing check non-return valve and inspection tee, all in 316 stainless steel and housed in a polyethylene access box. The inspection tee shall be fitted with a threaded hex plug that incorporates a pressure relief mechanism, e.g., a small screw that allows the slow release of pressure prior to removing the plug. This is to prevent the plug from rapidly ejecting when under pressure.

The boundary assembly shall not be installed in a depression subject to inundation and silt deposition. The boundary assembly shall be aligned perpendicular to the front property boundary to minimise aesthetic impacts on the property. The boundary assembly shall be installed at the correct depth using two 45 degree vertical bends upstream and downstream of the boundary assembly to maintain minimum pipe cover for the property discharge line. Refer to Drawing PSS-1102-V.

In bushfire prone areas the property boundary assembly access boxes shall be constructed in a more fire-resistant material. Details of the access box design/materials shall be specified on the design drawings.

5.4 Inspection and Testing

Refer to PSS Inspection Standards for the inspection and testing of on-property civil assets including:

- Property Boundary Assembly
- Property discharge line
- Collection Tank

The approved QA ITP's and Checklists for each installation procedure shall be completed and signed as required and returned to Sydney Water with all supporting materials. The following records shall be included with the QA Checklists:

- Pressure Testing records
- Compaction Testing records
- On-Property (civil asset) Installation Compliance record
- Written confirmation that maintenance equipment has been provided to Sydney Water

Quality Assurance records shall be prepared and submitted to Sydney Water prior to acceptance of on-property installation works. A compliance record is required for each individual on-property installation and all records shall be collated prior to handover of the system to Sydney Water.

5.4.1 Hydrostatic Testing of the Property Discharge Line

All lines shall be hydrostatically pressure tested by a Sydney Water certified tester in accordance with the testing procedure provided in WSA-07 Clause 21.4. The Contractor is responsible for submitting the provider Capability Checklist-Pressure Testers to Sydney Water.

To carry out the basic hydrostatic pressure test, all joints must be exposed. The joints can only be backfilled once the basic hydrostatic pressure test has been completed and the pipeline passed. Pressure test results shall be submitted to Sydney Water prior to acceptance of a lot.

The property discharge line shall be progressively hydrostatically pressure tested. The pipeline must be pressure tested after every 10 joints of pipe installed prior to any permanent restoration. If the hydrostatic test fails, the line shall be repaired or reinstalled and then retested.

To facilitate identification of leaks and installation defects, the Contractor may elect to carry out basic visual hydrostatic pressure tests with all joints exposed prior to certified pressure testing.

A compliance record is required for each individual discharge line and all records shall be collated prior to handover of the system to Sydney Water. Test results whether pass or fail shall be forwarded to Sydney Water using appropriate Sydney Water templates.

5.5 Property Plan

Property Plan shall comply with WSA 02 Sewerage Code of Australia (Sydney Water Edition) Appendix SW 3 and Sydney Water's 'Computer Aided Drafting CAD Standard for Engineering Drawings.

For on-lot property works, the primary WAE document shall be the Property Plan. As constructed photographs are to be taken with a GPS locator camera.

As a minimum, the following information shall be documented in MGA on the WAE Property Plan:

- a. All pipework, fittings, and structures must be located by survey and the location provided in MGA coordinates.
- b. Pressure sewer collection tank location – dimensioned from at least two fixed points (Note: fences are not considered fixed points for this purpose).
- c. Layout of new property discharge line and pressure sewer lateral – dimensioned from the nearest building and/or property line.
- d. All fittings used to accomplish horizontal bends shall be located on the plans and dimensioned from at least two fixed points.
- e. Location of property boundary assembly – dimensioned from the nearest two adjacent property lines.
- f. Location of pressure sewer lateral and point of connection to pressure sewer main.
- g. Property asset number for the pressure sewer collection tank.

The Contractor shall verify all underground services exposed during the works and document this information on the Property Plan.

6. On-Property Works – Mechanical and Electrical

6.1 General

6.1.1 Greenfield Developments

Before installation of any on-property mechanical and electrical works, the Contractor shall obtain the following documentation from the property owner:

- Electrical compliance certificate from the Builder's electrician
- Plumbing compliance certificate - Final Plumbing and Drainage Inspection Report issued by Fair Trading from the Builders Plumber.

6.1.2 Brownfield Developments:

The existing property main switchboard shall be audited by a licenced electrician to ascertain compliance with the current version of AS/NZS 3000 and a compliance certificate must be provided. A non-compliant switchboard will require upgrading to ensure compliance prior to commencement of any on-property electrical works.

6.1.3 Accreditation and Site Induction

Sydney Water approved Pressure Sewerage Product Suppliers provide accredited installation, testing and commissioning training courses. Only those workers that have undertaken this training shall be permitted to undertake on-property mechanical and electrical installation work.

All workers shall take part in a formal Product Suppliers accreditation process, and a log of workers qualifications (e.g. Contractor Induction) and training records shall be maintained for review by Sydney Water at any time. Induction process may be undertaken for several properties and does not need to be performed separately for individual properties.

6.2 Pump Unit

6.2.1 General

A pump with integral grinder unit shall be supplied for each pump well.

The pump shall be supplied with all necessary internal pipework and valving (minimum PN16 pressure rating) and level sensing equipment and installed as per manufacturer's instructions.

The pump shall be fitted with a permanently fixed lifting chain or equivalent to facilitate lifting. Discharge pipework shall not be used as a lifting mechanism.

The pumps shall:

- Be current models which have been in successful operation under similar conditions
- Be of one make
- Be suitable for operating in and transferring raw domestic sewage
- Have a maximum speed of 1500rpm
- Have a flowrate not less than 0.45L/s at the maximum design head

6.2.2 Pump Protection

As a minimum, the pumps shall have the following features:

- Run dry protection
- Thermal overload protection
- Over pressure protection via current or voltage sensing
- 15mins maximum run time
- Maximum 10 starts per hour
- Control circuitry inside the pump control panel, not the motor housing

6.2.3 Pump Materials

The pump materials shall be:

- Rotor: 316 stainless steel
- Shaft: 316 stainless steel
- Casing: Cast Iron or stainless steel
- Stator: Nitrile or Buna-N rubber
- Mechanical Seal: Silicon Carbide: Silicone Carbide

6.2.4 Grinder Units

The grinder shall be a single stage unit installed on the suction side of the pump. The grinder assembly shall:

- Have 440 Grade stainless steel rotating and stationary cutters
- Have rotating cutter positively secured to the pump/motor shaft
- Be dynamically balanced and operate without excessive noise or vibration over the manufacturer's recommended operating range
- Be constructed to eliminate clogging and jamming under all normal operating conditions including starting
- Be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects", such as paper, wood, plastic, glass, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the discharge piping

6.2.5 Pump Motors

Electric motors shall be squirrel cage induction type with a low starting current.

Inherent protection against overloads or locked rotor conditions shall be provided with an automatic-reset, integral thermal overload protector incorporated into the motor.

The electric motor shall be minimum IP68 for submergence to a depth of 6 metres with an equally rated IP68 cable disconnection that allows for simple plug and play without potential for moisture entry.

6.2.6 Identification

Each pump shall be fitted with a stamped or embossed stainless steel nameplate and attached using stainless steel drive screws. The nameplate shall not be painted.

Nameplate details shall include:

- manufacturer's name
- motor kW
- model number
- serial number (Serial number shall not be painted onto the pump)
- speed
- year of manufacture

6.3 Control Panel

6.3.1 General

A control panel shall be supplied for each pressure sewer unit. The control panel shall contain the operational controls and alarms needed to operate the pump.

As a minimum, the key controller functions required are as follows:

- To shut the pump off under high pressure via current sensing
- To limit the pump shut off head (adjustable function)
- To limit the pump run time (adjustable function) with an adjustable OFF time
- To limit the pump number of starts per hour (adjustable function)

Refer to Sydney Water I & C Standards for more details.

6.3.2 Identification

The Contractor shall attach a sticker on each control panel identifying the property specific asset number and other details as shown in Appendix 1 - Control Panel Label. These are to be fixed on the outside of the control panel door.

The sticker shall be as follows:

Size: 120mm x 190mm

Material: Premium quality (3M or equivalent), self-adhesive vinyl with matching satin clear overlamine

Finish: Full colour, digitally printed content, UV resistant for minimum 5 years

Labels can be purchased from Cunneen & Company Pty Limited, 9 Peel Street, Holyroyd NSW 2142 or suppliers of equivalent stickers. Where other suppliers are used a sample of the sticker is to be provided to Sydney Water for approval. Application of stickers from equivalent suppliers shall only occur after written approval from Sydney Water.

The Contractor shall record each asset code provided on the 'As Constructed' drawings against respective property plans and asset register.

6.4 Installation and Testing

6.4.1 General

The Contractor shall prepare property design drawing and standard drawings showing the typical on-property layout requirements for mechanical and electrical assets. The property design shall detail the location of the on-property infrastructure (i.e. property boundary assembly, property discharge line, collection tank and control panel).

All materials and items shall be installed in accordance with manufacturer's recommendations.

During installation, the Contractor shall be responsible for the following installation activities:

- Pre-installation photographic records
- Check plumbing compliance
- Check dwelling's electrical works
- Check electrical conduits provided appear free of obstruction and have draw wires installed
- Install control panel and electrical cables
- Install power cable between the isolation switch and control panel
- Install pump unit
- Test and commission the pump unit as per the manufacturer's instructions
- Restore the site and take post installation photographic records
- Obtain signed clearance letter from property owner or builder
- Submit handover documentation

In performing these tasks, the Contractor shall be responsible for:

- Co-ordinating with the Water Services Co-ordinator or Sydney Water as required
- Managing the delivery of pumps and control panels from the supplier
- Obtaining all necessary statutory, Workplace Health & Safety and Environmental approvals
- Completing all preinstallation documentation
- Preparing and submitting all Work as Executed documentation

6.4.2 Check Plumbing Compliance

The Contractor shall undertake a visual inspection to confirm that the property's overflow relief gully (ORG) complies with AS/NZS3500 requirements. This includes checking:

- The top of overflow relief gully is minimum 75mm above the finished surface level and minimum 150mm below the lowest fixture level.
- An overflow relief gully flood cover has been installed.
- Gully trap is not located in an area which may be inundated by overland water flow.

6.4.3 Check Dwelling's Electrical Works

A licenced electrician shall check the dwelling's following electrical works comply with codes and standards:

- main switchboard
- isolation switch

- junction box
- power cable from switchboard to isolation switch and junction box

A copy of the certificate of compliance of electrical works to prove that a licenced electrician has performed the necessary safety checks must be provided.

The main switchboard shall be checked if:

- any asbestos is present (if applicable). If the electrical distribution box contains asbestos, the Contractor shall prepare an Asbestos Management Plan for the site.
- a separate, dedicated circuit in the main switchboard has been provided and clearly labelled with a traffolyte label: "PSS Pump Unit". The size of the circuit shall be in accordance with the manufacturer's installation requirements. This circuit must not be used for other property power supplies.

The Contractor shall confirm the location of the isolation switch (indicated on the Property Plans) with Sydney Water as it will dictate the location of the control panel. The isolation switch shall be within 10m line of sight to the collection tank.

6.4.4 Check Electrical Conduits

The Contractor shall check that home builder has installed draw wires in all conduits provided and that the conduits are clear of any debris, or other materials. Electrical conduits shall be min 500mm deep, and not to share trenches with house service line or discharge line. External conduits and above ground conduits subject to the possibility of damage must be mechanically protected e.g. metal plate at ground level.

6.4.5 Install Control Panel and Electrical Cables

The control panel shall be mounted preferably 1500 mm but a minimum of 1200mm above ground level. The control panel shall be no more than 300mm from the isolation switch.

Install the control panel in accordance with the manufacturer's instructions, AS/NZS 3000 and any other requirements of the relevant electrical authority. The control panel shall be in clear sight of the collection tank and no more than 10 m away. Distances more than 10m require special orders to the manufacturer for a longer (no joints) pump cable to be supplied.

The Contractor shall install electrical cables (one for pump, one for level sensor and one for auxiliary float switch where fitted) in the conduits between the collection tank and the control panel. Max 610mm of electrical cables to remain inside tank.

The electrical cables shall be connected to the control panel via bottom entry. Manufacturer's pre-fabricated conduit cable entries shall be used where possible. Conduits entering the control panel shall be of corrugated type with a suitable watertight gland, to prevent moisture entering the control panel. This is required for uniformity when replacing faulty equipment.

Attach identification label to the front of the control panel with the correct SL number printed on it.

6.4.6 Install Power Cable

The Contractor shall install power cable in the conduit from the junction box to the control panel in accordance with:

- Sydney Water's supplement to WSA-07
- AS/NZS 3000 Electrical Wiring Code

- Local energy supplier requirements

6.4.7 Install Pump Unit

Prior installation of pump unit, the sanitary sewer line shall be flushed, and any debris washed into the collection tank shall be removed.

The pump unit shall be installed in accordance with the pump manufacturer's instructions.

Only pipes and fittings provided by the pump unit manufacturer shall be used to make the connection between the pump unit and the discharge connection in the collection tank.

6.4.8 Test and Commission the Pump Unit

The pump and control panel shall be tested in accordance with the manufacturer's testing and commissioning procedure.

The control panel shall be tested for normal operation of the pump and for the alarm modes, including over pressure, max run time and max starts per hour. Refer to PSS Inspection Plan for details.

6.4.9 Restore the Site

Any damage caused by the Contractor as a result of works shall be rectified and restored to its pre-installation condition by the Contractor. The Contractor shall provide post installation photographic records as evidence.

6.5 Work As Executed Information

Upon receiving acceptance from Sydney Water, the Contractor shall provide Sydney Water with:

- Updated as-constructed property plans to include locations of control panel, electrical cabling, control alarm cable, isolation switch and pump serial number.
- Signed Inspection and Test Plan
- Signed inspection checklists
- Signed testing and commissioning forms
- Clearance letter from the property owner
- Asset Management Handover Documentation

Updated property plan files and reticulation system Work As Executed drawing files are to be provided as an integrated file for inclusion in Sydney Water's GIS system.

Any plan produced as a Work As Executed drawing, without Sydney Water's signature on any significant amendment, will be rejected during handover of the works.

7. Handover

7.1 Asset Information

The Contractor shall prepare the following information in the form of an editable excel spreadsheet.

- Sydney Water Asset Number
- Property identification details (Address, Lot, DP, co-ordinates of property boundary assembly and collection tank)
- Pump serial number
- Panel serial number
- Type of unit installed (Simplex/ Duplex/ Other etc)
- Dates of installation (for collection tank and pump)
- Dates of testing
- Date of commissioning

7.2 Provision of Maintenance Equipment

As a minimum, the following equipment shall be provided to Sydney Water prior to project handover:

- Lifting and trolley device (5 off)
The device shall be a combination unit capable of lifting and trolleying the pumps to a nearby maintenance vehicle.
- Electrical setting/diagnostic equipment (5 off)
- Any specialist tools recommended by the pump, collection tank or control panel manufacturer (5 off)
- Complete Pressure Sewer Pump units (10% of the number of units used on the project)
- Pump Control Panels (10% of the number of units used on the project)
- Level sensors and assembly (10% of the number of units used on the project)
- Auxiliary float switch (10% of the number of units used on the project)

The contractor shall provide written confirmation of delivery to Sydney Water as part of the handover documentation.

Ownership

Role	Title
Author	Pressure System Solutions - Craig Kennedy, Wayne Kennedy
Controller	Nana Keong (Senior Engineer, ETS)
Owner	Norbert Schaeper (Manager Engineering, ETS)

Change history

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1.0	Pressure System Solutions	27/04/2021	Norbert Schaeper	30/06/2021

Appendices

Appendix	Title
1	Control Panel Label

Appendix 1 Control Panel Label

