

Pressure Sewer System – Technical Specification

1 Purpose

The purpose of this document is to detail the Pressure Sewer System – Technical Specifications.

2 Specifications

3 Pipes and Fittings

3.1 Pipe Materials

All pipes shall be in accordance with AUS-SPEC.

Minimum pipe classes are as follows:

- Polyethylene Class 12.5
- MPVC Class 16
- DICL Class K9

Minimum nominal pipe internal diameter is to be 32 mm for household connections and 50 mm for pressure sewer mains.

3.2 Valves

The valves for the boundary kits and at the pressure unit shall be supplied as followed:

All shut off valves shall conform to AS1628.

All check valves shall be swing check valves, which conform to AS1628.

All shutoff valves shall be clockwise closing.

All valves shall be constructed from corrosion resistant materials.

4 Pump Wells

4.1 Materials

Pump wells may be constructed from:

- Fibreglass (GRP);
- HDPE; or
- LDPE

All metalwork within the pump well shall be stainless steel Grade 316. Council may approve other corrosion resistant material where adequate corrosion performance can be demonstrated in systems installed elsewhere.

All fasteners shall be stainless steel grade 316.

4.2 Storage Requirements

Pump wells shall have a minimum storage of:

- Total storage volume in well (above bottom water level) of 700 litres.
- Emergency storage volume component (above alarm level) of 400 litres.

4.3 Well Shape

Pump wells will be selected to allow the most economic installation.

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

For normal installations it should be assumed that the cover to the incoming pipe might be up to 1m.

The wells must be designed to resist uplift. The design should prevent the units from floating with the water level at the top of the unit. This may be achieved by the use of concrete.

The units shall be shaped to bond well with any concrete or other backfill material.

Provide a factor of safety against floatation of at least 1.5.

4.4 Well Construction

The pump wells shall be delivered as complete fabricated units.

It shall be possible to install them using small lifting equipment in areas of minimal access for construction equipment.

The wells shall be of leak-proof design using proven materials and manufacturing techniques. They shall be designed for a service life of not less than 50 years.

Provide all accessories required to allow the household connection pipe to be connected with a watertight seal. The seal shall ensure that there is no leakage of groundwater into the well.

Provide a connection stub for the rising main.

Factory seal all penetrations through the well wall (other than the household drainage line) to ensure no leakage of groundwater.

The well floor shall be sloped to the pump-out location to allow a minimum retention at pump cut-out, and to assist in solids removal.

The wells including lids shall be constructed from materials that are not subject to corrosion from the sewage or galvanic action. All parts open to sunlight shall be resistant to UV degradation both in strength and colour.

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

The lid to the well shall be secured to the well body in such a way that it cannot be removed without special tools. The lids shall also be lockable. The lids shall be lightweight, so that one person can open them.

All visible parts of the wells and lids shall be of an unobtrusive colour.

Removal of the lid from the pump well, 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 well is near full (but below the level of the pump connection point) of sewage.

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

4.5 Identification

Each pump well shall be identified with a unique serial number.

The number shall be:

- Permanently inscribed onto the well at the time of manufacture;
- Be located in a position that can be read after installation.

The quality assurance system shall provide traceability of manufacture from the serial number.

The serial number shall not be painted onto the well or be on an attached plaque.

4.6 Ventilation

Provide ventilation so that sewage can fill to the top of the tank and empty without causing pressure build-up or suction in the tank.

This ventilation may be provided through the lid.

For flood prone areas, the ventilation system shall ensure that floodwater does not enter the tank.

5 Pump Units

5.1 General

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

The pump shall be supplied with all necessary pipework within the pressure unit, valves and pressure sensing equipment.

All pumps supplied shall be fully interchangeable.

The supplied pump units shall be capable of operation in any reticulation area, and thus the duty point must be adequate for the area with the highest head requirement.

The pumps shall:

- Be self-priming;
- Be current models which have been in successful operation under similar conditions;
- Be all of one make;
- Be suitable for domestic, commercial and industrial sewage;
- Be suitable for intermittent operation with up to 10 starts per hour;
- Have a maximum speed of 3000 rpm.

5.2 Removal, Reinstallation and Maintenance

The pump shall be able to be lifted by a means other than the discharge pipework i.e. a permanently fixed lifting chain or equivalent.

If the individual pumps supplied weigh in excess of fifteen (15) kilograms wet weight, a lifting and trolley device is to be provided that is capable of manually removing, trolleying and reinstalling the pumps.

Ideally the device would be a combination unit capable of lifting and then trolleying the pumps to a nearby maintenance vehicle.

5.3 Duty Point

Pumps shall have a flow rate of not less than 0.45 L/s at the design maximum head.

The design maximum head shall be the worst case operational head for the proposed reticulation areas, but shall not be less than 40m.

5.4 Pump protection

The pumps shall have the following:

- No flow protection;
- Overload protection

5.5 Pump Materials and Manufacture

The preferred pump materials are:

- Shaft material : Stainless Steel;
- Rotor material : Stainless Steel;
- Stator material : Buna-N or proven alternative

5.6 Grinder Units

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

The grinder assembly shall:

- Have hardened alloy steel rotating and stationary cutters;
- Macerate solids into fine particles that will pass easily through the pump;
- 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 so as to eliminate clogging and jamming under all normal operating conditions including starting;
- Create sufficient vortex action to scour the tank free of deposits or sludge banks which would impair the operation of the pump;
- Be capable of reducing all components in normal domestic, commercial and industrial 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.

5.7 Identification

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

Nameplate details shall include manufacturer's name, pump type, capacity, size, motor kW, serial number, order/contract number, speed, and year of manufacture and pump casing test head.

Each pump shall be identified with a unique serial number.

The quality assurance system shall provide traceability of manufacture from the serial number.

The serial number shall not be painted onto the pump.

5.8 Electric Motors

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

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

For submersible pumps, the electric motor shall be IP68 for submergence to a depth of 6 metres.

6 Boundary Kits

6.1 General

Each property will have a boundary kit consisting of:

- Isolation valve;
- Check valve;
- Flushing point;
- Pit and cover.

6.2 Pit and Cover

The pit shall be large enough to contain valves and flushing point.

It shall have a cover which can be secured so that it cannot be opened by unauthorised personnel. The pits shall be designed to be installed with the cover flush with the ground surface.

The pit and cover shall be constructed from materials that are not subject to corrosion.

All parts open to sunlight shall be resistant to UV degradation both in strength and colour.

Some pits and covers may be subject to vehicle loads.

Where pits and covers may be subject to vehicle loads pits supplied must be capable to withstand a 500 kg live load from a slow moving vehicle for these situations.

All visible parts shall be of an unobtrusive colour.

7 Pump Control

7.1 General

An alarm/control panel shall be supplied for each pump well.

The control panel shall contain the operational controls and alarms needed to operate the pump.

The panel will be installed by the unit installer.

7.2 Level Sensors

Supply level sensors for measuring the level of sewage in the pump well.

The primary sensors may be integral to the pump unit, or separate from the pump.

A separate level sensor shall be used to detect high level in the pump well and to provide a high-level alarm signal. This shall be a back-up system to provide an alarm should the main level system fail.

Level sensors may be pre-installed at the factory. If not factory installed, the installer must be adequately trained to install the sensors and correctly set their levels.

7.3 Panel manufacture

For each pump well provide an electrical alarm/control panel.

The panels shall be suitable both for wall mounting and pole mounting.

The Panels shall be constructed to comply with AS/NZS 3000 Electrical Installations

Control circuitry and or level sensors operating in the wet well shall be Extra Low Voltage in accordance with AS/NZS 3000 Electrical Installations

The alarm/control panels shall be of weatherproof construction to a minimum IP56. All penetrations shall be on the underside of the panel only and an appropriately sized gland is to be provided to prevent any water ingress.

The panel shall be lockable, with the lock keying integrated with Coffs Harbour City Council's master key system.

The panel shall be fitted with stainless steel hinges and locking latch. Council may accept other corrosion resistant material where adequate corrosion performance can be demonstrated.

Internally, the panel shall have a safety barrier which covers the entire area of the panel and which only allows access to the operator controls.

7.4 Controls

The pumps shall be controlled by probes or pressure sensors installed in the pump well. The probes or pressure sensors shall indicate the following levels:

- Low Level – the pump stops;
- High Level – the pump starts;
- Above High Level – the alarm is activated.

A below low level sensor may also be supplied which shuts down the pump and activates the alarm.

The low level shall be set as low as possible, while maintaining adequate submergence of the pump.

The high level shall set as low as possible to minimise storage, while not exceeding allowable pump start frequency at any flow rate.

The above high level shall be set so that in normal operation it is not reached.

There should be adequate volume between high level and above high level to balance instantaneous inflows.

If the operating levels can be adjusted they shall be readily adjustable by a worker while remaining outside the well, and while complying with all OH&S requirements for safe working.

Control circuitry shall be contained in the alarm/control panel.

The panel shall also have an OFF/Auto/ON switch for the pumps.

The ON setting shall bypass all pump controls except the thermal overload.

The pumps shall be protected from overload and over pressure operation.

In situations of recovery after a blackout, pumps shall operate in an orderly manner with appropriate controls.

7.5 Alarms

The preferred operation of alarms shall be as follows:

- Above High Level: visual and audible alarm activates but pump does not stop.
Alarm resets when the high level condition is rectified.

For all other faults including over temperature, no flow, over pressure, overload, and below low level the pump stops and operation re-commences when the fault is rectified.

The controls shall ensure that the maximum pump starts per hour is not exceeded.

The visual alarm shall be mounted on the control panel, and only be reset by a switch mounted inside the control panel.

The audible alarm shall have a sound level which complies with DEC noise levels for the area, and not have any objectionable tonal qualities.

The audible alarm shall have an externally mounted "Alarm Acknowledgement" button which deactivates the alarm. This button will deactivate the audible alarm, but not the visual alarm. The alarm will not reactivate till the control system is reset.

The audible alarm shall run for a maximum of five (5) minutes and cannot be restarted until the “Alarm Acknowledgement” button is activated.

The control panel shall have a reset procedure, which can only be carried out when the panel is opened. The procedure could use the OFF/Auto/ON switch or a separate “Reset” button.

The audible alarm shall be capable of field disconnection without interference to any other electrical functions.

8 Electrical Installation

All Electrical work shall be performed by a Licensed Electrician and shall be constructed to comply with AS/NZS 3000 Electrical Installations

The alarm/control panel is to be suitable for connection to a standard residential meter panel.

Normally only single phase operation should be used, however three phase power may be considered in special installation designs.

Three phase power should only be used where inspections show that it is available.

9 Spare Parts

Supply sufficient spare parts and equipment to ensure that Coffs Harbour City Council will always have adequate replacement parts to allow service crews to take a replacement unit to all call outs.

Spare parts shall be supplied to Coffs Harbour City Council depot.

10 Testing and Commissioning

10.1 Factory Type Testing

Before any units are installed, the following tests are to be carried out at the suppliers workshop.

Alternatives may be considered by Council if the supplier can provide details of a proven, standardised testing regime already adopted by the factory that addresses the intent of the following clauses.

If the unit supplier has already carried out type testing, type test certificates which cover the required tests may be accepted in lieu of factory testing.

Supply certificates giving records of tests carried out.

10.2 Pumps

Pump tests shall be carried out in accordance with AS 2417- 2001 Annex A, or where this standard is not applicable, applicable international standard.

The pump casings shall withstand the hydrostatic test pressure scheduled for a period of 15 minutes without any leakage or permanent distortion.

10.3 Pump Wells

The unit shall be hydrostatically tested, to ensure that all penetrations are watertight.

Prepare the test unit for testing by installing a short section of test pipe, using the method proposed for the installation of the gravity sewer pipes and seal off all pipe openings and vents.

Test the unit to a hydrostatic test pressure of 3m above the top of the well.

The test will pass if there are no drips or weeps.

11 Site Testing and Commissioning

Site testing will be carried out by the unit installer.

Completion of commissioning of any unit will mark the start of the warranty period for that unit.

11.1 On-property Tests Generally

All operational tests on the pumping units are to be conducted using town water (or approved equivalent) with the pumping unit only being connected to the sewerage reticulation system after these tests using town water have been successfully carried out.

11.2 Leakage Test

The leakage test will be carried out after completion of all pipework connections, but before the electrical control panel is switched on.

- The pump well will be filled to the underside of the lid.
- Loss will be observed after a minimum of 2 hours.
- No leakage should be observed.
- This test is to test the pump well, pipe seals and part of the connecting pipework.
- The connecting pipes may need to be plugged temporarily.

11.3 Simulated Power Failure Test

It is expected that the leakage test will be conducted immediately before tests for operational readiness and as such the initial operational tests will commence with the pump storage vessel being filled to a high water level.

It will thus be expected that the pump should commence in an alarm mode when the power is turned on to the alarm panel, as per a power failure scenario.

This will be the first test to determine if the alarms will automatically turn on and then off, as the pump reduces the volume stored in the storage vessel to below the high level alarm and then to the normal pump off levels.

11.4 Time Based Operational Test

The pumps will be considered operationally ready when they have successfully operated for a period of one to four hours with a constant inflow rate of around 0.1 to 0.2 L/s (this is the typical inflow from a garden hose discharging into the system at reasonable pressure).

Such a test should involve several on and off cycles of the pump itself.

The variable time period has been included to allow for regions where there are drought conditions being experienced or there is a lack of water for other reasons.

The test may be reduced to just the one hour to minimise any water wastage.

Council will instruct the unit installer as to the test to be carried out.

11.5 Alarm Test

In addition to the above operational test, the unit installer will suddenly discharge quantities of water into the pumping unit's storage vessel rapidly from large water containers, such that the alarm level is exceeded.

The pumping unit is then to be observed to see if the alarm initially comes on and subsequently if the alarm then automatically shuts off, after normal pumping levels have been achieved.

11.6 Pump Protection Test

The pump is also to be tested against a closed valve, to ensure that the pump's safety cut-outs are working satisfactorily.

This test need be conducted only once and due precautions should be taken against sudden pipe failure.

The valve to be tested against will be the boundary property valve.

11.7 Commissioning of Pumps

The commissioning will consist of opening the isolation valve(s), and turning on the control panel for automatic operation.

Commissioning will be completed after one week of fault free operation.

11.8 System Test

Based on the design calculations provided by the designer, Council intends to carry out tests of the installed system.

Flow rates and pressures may be measured as part of this test to ensure that the system performs in accordance with the design.

Any significant departure from the anticipated performance will be referred to the designer and/or unit installer for rectification.

11.9 Warranties

All warranties are to be provided in the name of Coffs Harbour City Council.

Provide a minimum two (2) year warranty on all equipment supplied.

The in service warranty shall start from the time of commissioning of the pump.

For pumps supplied as spare parts, the warranty will start when the unit is put into service as a replacement unit, subject to the total warranty period not exceeding two (2) years.

If equipment is repaired or replaced under warranty, the warranty period for that item shall start on the date that the unit is repaired or replaced, or the date that it is put into operational service again, subject to the total warranty period not exceeding two (2) years.

11.10 Manuals

The unit installer shall provide an operation and maintenance manual for the system.

The manual shall comprise the following sections:

- Introduction;
- General principles of operation;
- Technical details of all equipment supplied;
- Typical installation schematics;
- Routine Maintenance (if applicable);
- Troubleshooting;
- Dismantling and re-assembly procedures;
- System design drawings for each area;
- Training Manual.

The manuals will be controlled documents.

Provide three (3) controlled copies (hard copies) and one (1) electronic copy of the manuals.

Establish a document control procedure to ensure that the manuals are kept up to date.

12 Authorised Manufacturer/Technology Supplier

eone <http://www.enviro1services.com.au/>

Aquatec <http://www.aquatecenviro.com.au/>

13 As Constructed Information Package

It is intended that a file will be maintained on each pressure sewer system area, and thus information will be required on the design of each system. Information submitted to Council shall be in an electronic format and shall include, but not limited to the following:

13.1 Reports

- Concept Report
- Design Report
- Final Design Report

13.2 Reticulation Mains

- Work As Executed Drawings as per Council's standard requirements
- Long sections to indicate pipelines that have been directionally drilled
- Date construction completed for the pressure sewer system area
- Date made operational
- Date boundary kits installed on the property
- Pressure test results and verification
- Date each property lateral laid

13.3 On-Property Information

- Property Address, owner's details and any special property features
- Work As Executed (WAE) drawing for each property. Sewer Service Diagram (SSD) requirements for the house drainage details can be included with the Work As Executed drawings. The house drainage portion of the WAE to comply with all the rules and regulations of NSW Fair Trading for SSD's. Plans to include but not limited to the following details:
 - well location
 - house sanitary drain connection location
 - all pipe, valves and fittings up to the boundary kit
 - control panel and power and control cable locations
 - boundary kit location
- tapping point and isolation valve location on common rising main
The date work commenced on the property
- The date the work was completed and the installer had left the property
- The date the pump made operational and results of pump testing
- Date and number of pump commissioning certificate
- Manufacturer, serial number and warranty information of pump station/collection tank
- Isolation details for the site
- Electrical details
- Operation and Maintenance Manual and emergency contact details

14 Definitions

N/A

15 References

N/A

16 Details of Approval and revision

- Approval date: 13/02/2018
- Responsible Section: Asset Project Delivery
- Superseded policies/procedures:
- Next review date: 13/02/2022

Table of amendments

Amendment	Authoriser	Approval ref	Date