



Requirements for Water Supply Pump Stations

Version 1.0 revised edition

For land development

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MESSAGE FROM THE GENERAL MANAGER

Please note that Barwon water has changed the look and accessibility of the land development manual to improve your ability to access and review it including separating Barwon Water's design and survey requirements into separate documents.

This edition of the Barwon Water Requirements for Water Supply Pump Stations has the same content as the version available on this web site prior to 30th June 2010 with the exceptions listed in the amendment history and changes to fonts styles.

Barwon water will periodically update this document however the previous version will remain accessible on our public web site. This edition applies to all offers issued on or after the publication state unless otherwise noted in the works offer.

Luisa Muñoz
General Manager
Customers and Communication.

Amendment history

UPDATE NUMBER	BRIEF DESCRIPTION	EFFECTIVE DATE
1.	<ol style="list-style-type: none">1. Separation from the Land Development Manual2. Addition of Amendment History section3. Insertion of cover page, preface, introduction, headers, footers and content page	JUNE 2010

1 Security of supply

Customers expect that water will always be available when required and will not accept pump failure or a power interruption as an excuse for loss of supply.

To ensure a pumped system is as reliable as a gravity system all pump stations shall have stand-by capabilities at 100% of the design capacity. The stand-by pump must be ready to operate when required and shall become the duty pump at midnight each day. The stand-by pump shall also become the duty pump at any time the duty pump becomes unavailable.

Booster pump stations shall have provision for the stand-by pump to work in tandem with the duty pump if demands exceed the pump capacity. This would normally be a temporary situation such as fire fighting or a burst main. The stand-by pump shall be activated by a loss in delivery pressure and the two pumps will adjust to operate at a similar frequency. The stand-by pump shall shut down once delivery flows have returned to a mid-range value indicative of normal demands.

Transfer pump stations shall be fitted with a socket and switch so that a generator can be connected during power interruptions. The switch will isolate the mains supply so that a generator can be plugged in. Barwon Water shall be consulted on the size of the plug as it is possible the new pump station could be serviced by existing generators. The connection point and switch shall be positioned inside the pump station for security although provision shall be made to pass the cables through the wall so that the pump station can still be locked. A hardstand area shall be provided adjacent to the pump station along with sufficient access to back the generator into position.

A power interruption to booster pump stations will normally result in immediate loss of supply or pressure to customers. These pump stations shall be supplied with a permanent generator which automatically starts once power has failed. The generator shall also stop once power is restored. The generator shall be mounted within the pump station to limit noise to adjoining properties and a switch to isolate the mains supply provided so that automatic start up can be tested at regular intervals. Forced ventilation shall be provided and linked to start-up so the building can be entered while the generator is running. An enclosure for the generator shall also be provided if noise levels inside the pump station exceed safety limits. The battery for the generator shall be connected to the power supply to maintain a fully charged state at all times.

2 Building and surrounds

All water supply booster pump stations shall be constructed above ground to facilitate operation and maintenance of the asset. This also applies to transfer pump stations (except where the pumps need to be below ground to utilise the full storage capacity of service basins).

The building shall be of double brick construction using Nubrick "Amber Trewallyn" or approved equivalent (solid brick). The finish shall be straight edge (not tumbled) and the joints raked. A concrete slab roof shall be provided if required for noise attenuation otherwise Colourbond "Rivergum".

Doors shall be metal clad solid core flush doors with acoustic seals and steel door frame. If the pumps are too large to be removed manually, a double door shall be provided to allow access for a small crane to remove the pumps. The doors shall be a minimum height of 2400mm to accommodate the removal. A personal access door of the same construction shall be provided for day to day access to the pump station. Intake and exhaust acoustic louvres shall be provided for air flow through the building. The exhaust louvre shall be mounted near ceiling height and include an exhaust fan which automatically operates when the generator is running. A manual on/off switch shall also be provided. The intake louvre shall be mounted close to the floor on an opposite wall for maximum air transfer. Both louvres shall be vermin proofed.

The floor shall be a concrete slab with a float finish and set above ground level to prevent external surface water entry. A concrete apron (minimum width 2m) shall be provided adjacent to the access doors to assist in loading and unloading equipment. The apron and surrounding crushed rock hardstand shall slope away from the building. Care shall be taken to avoid a step between the floor level and concrete apron which would constitute a tripping hazard.

If a colourbond roof is supplied, the ceiling shall be of a waterproof material to guard against damage from leaking joints. A desk and chair shall be provided within the building to accommodate a visitor's book and to provide a working area for the operator or technician. Lighting shall be fluorescent and include a fixture above the desk. External lighting shall also be provided. An internal double power point shall be provided along with a double external power point and circuit breakers within the switchboard.

Cut and fill slopes for the building surrounds shall be no steeper than 1 in 3 to assist in mowing. The site shall be free draining including access tracks and hardstand areas. Any valve or pipework pits constructed as part of the works shall be sealed against groundwater entry and shall be a minimum of 150mm above finished surface levels to avoid surface water entry. In-ground pump stations shall have an automatic sump pump for self draining.

The cover for the pit shall be grating if within a secure Barwon Water compound otherwise a solid cover shall be used. Access hatches in solid covers shall have a raised lip with adequate clearance to inject a weatherproof sealant around the hatch perimeter to prevent rainwater entry.

Due to confined space regulations, all pits shall be engineered to avoid entry for routine maintenance or operational duties. For pumps below ground, switchboards and control panels shall be mounted above ground level including flowmeter and pressure transmitter displays. Valve extensions shall be provided to the surface for

valve operations. At sites where there are no adjacent buildings to mount the switchboard, a brick building shall be constructed directly above the pump station to provide a secure and weatherproof environment for operations and maintenance.

At sites where a security fence is required, it shall be post and rail(no crank) with 1800mm black plastic coated wire and 3 barbs. Double gates shall be provided for vehicle access along with a personal access gate if requested.

3 Pumps

It is vital that booster pump stations provide a similar level of service to a gravity supply. Customers expect a consistent pressure through a range of demand conditions which is difficult to achieve using fixed speed pumps. Booster pump stations shall therefore utilise variable speed drives so that a consistent pressure is supplied at all times. In particular, the pumps shall not deliver a pressure above the duty point during low demands but shall be able to maintain the duty pressure at peak demands(see also Security of Supply).

The control system shall be arranged to allow direct on line starting and manual control of the pumps in the event of failure of the automatic controls.

The pump selection shall ensure there is sufficient Nett Positive Suction Head available to avoid cavitation within the pump.

The booster pump station shall include a pressure vessel which provides a small storage during low demand periods to reduce the number of pump starts. For larger areas a small pump shall also be considered to meet low demands at night. This will reduce the range required of the main pumps.

The pump base shall be constructed of stainless steel and consideration shall be given to avoid connections of dissimilar metals which would lead to galvanic corrosion.

Pump controllers shall be independent of the pumps so that repairs can be undertaken without taking the pumps off line. Manual start and stop of the pumps shall be available during these periods.

Each pump shall be capable of being isolated for maintenance without impacting the performance of the pump station. A flexible joint shall be provided to facilitate the removal of the pump and the non return valve for maintenance. Consideration shall be given to pump forces in locating the flexible joint to avoid future leakage and lateral movement of pipework.

The operating conditions of the pumps shall comply with noise levels as stipulated by the Environment Protection Authority for residential areas. These should be considered as a minimum standard to ensure adjoining residents are not affected by pump operations. Consideration shall also be given to safe noise levels within the pump station for system operators.

4 Valves, flowmeters and pipework

All external pipework shall be ductile iron or sintakote steel and internal pipework either ductile iron, mild steel or stainless steel. Ductile Iron and Mild Steel pipework shall be cement lined. Stainless steel pipework shall be grade 316.

No uniflanges or equivalent shall be permitted in the pipework.

Sluice valves shall be epoxy coated and of the non rising spindle type, fitted with handwheels and anti-clockwise closing onto metal seating. Butterfly valves may be used including wafer types and shall also be fitted with a handle. The class of valve shall suit the specified test pressure.

An electronic flowmeter shall be provided with sufficient upstream and downstream clearances as per the manufacturer's specifications. If the pump station has a bypass, the flowmeter shall be positioned to measure either pumped or bypass flows. The flow shall be displayed continuously within the pump station and linked to the telemetry system.

For booster pump stations with positive suction, a pump bypass shall be provided to maintain supply when the pumps are unavailable. The bypass shall have a non-return valve with isolating valves either side to enable maintenance on the valve while the pumps are operating.

Pressure sensors shall be installed on the suction and discharge pipework and linked to the telemetry system. The suction and discharge pressures shall also be displayed within the pump station on the instrument panel.

The pumps shall be levelled and aligned prior to connecting the pipework to ensure they are correctly balanced. In order to reduce stress on the pump, restraints shall be provided either side of flexible joints on discharge pipework within the pump station.

Precautions shall be taken to avoid air entrapment and flow distortion by providing a minimum of 10 pipe diameters of straight pipework between any 90 degree bends and the pump. This will reduce cavitation.

5 Telemetry

A Remote Telemetry Unit shall be provided at the pump station to provide a connection to Barwon Water's existing radio based telemetry system. The RTU shall be a Kingfisher II system as used by Barwon Water at existing installations and shall provide an input connection for signals to ensure reliable monitoring and operation of the pump station. Provision shall also be made within the RTU for remote operation of the pump station if required.

An Operator Interface Unit shall be provided at the pump station to display flow, pressure and pump station data and trends. This will assist the operator in monitoring the performance of the pump station on site and investigating any problems which arise.

The following data is required from the telemetry:

- Pump available, pump running, pump fault, pump hours run, pump power(kW)
- Upstream pressure, downstream pressure
- Instantaneous flow, totalised daily flow

Alarms shall be set by Barwon Water for response to these items.

6 Operations and maintenance manuals

These manuals are critical to the future operation and maintenance of the pump station and provide an important reference for operators and managers. Key information must be readily accessible and not buried in product manuals which can be difficult to find.

The manual shall include general arrangement and site layout plans along with wiring and process diagrams. The plans shall include all amendments made to the original design during construction and shall be signed off “as constructed” by the project manager.

Product manuals from the manufacturer are required but often include a full range of products which are not relevant to the project. The Operations and Maintenance Manual shall include an asset register of all major components including model number, serial number, manufacturer, capacities, diameters and materials. A typical asset register for a pump station shall include details on the following;

- Each pump and pump motor
- Non-return Valves
- Flow meters
- Sluice Valves
- Air Valves
- Pressure Transmitters and Gauges
- Pipework

Valve descriptions shall include flange table ratings.

The assets listed in the register shall be included in a maintenance schedule. The schedule shall include routine inspection and maintenance tasks including frequencies and details of works required. A reference to the product manual is not acceptable.

Pump curves shall be provided for each pump(only for the pump provided – not a range of pumps) on a separate A4 sheet. A reference to the product manual is not acceptable.

The Operation and Maintenance Manual shall include a written description of how the pump station will function to meet the design brief. This shall include details on cut-in and cut-out(pressure or flow?), duty/stand-by arrangements, staged pumping settings, overload provisions and pump protection.

Once a pump station is commissioned and the contractor has left the site, there are often delays in getting an acceptable Operations and Maintenance Manual. A draft of the Operations and Maintenance Manual shall therefore be submitted to Water Supply for comment a minimum of two weeks before commissioning of the asset. The manual will be returned with comments within one week and commissioning shall not proceed until final amendments are made and the manual is complete. The final manual shall include “as constructed” drawings and a minimum of two copies shall be provided to Water Supply.

7 Drawings

Draft designs submitted for comments or approval need to be legible and shall be submitted on A3 sheets as a minimum.

Once construction is complete, a full set of A1 sized “as constructed” tracings shall be provided to Water Supply for clarity and permanent reference. Electronic drawing files are also required for corporate storage. Drawings in Operations and Maintenance manuals shall be a minimum of A3.

Pump station drawings shall include a general arrangement plan view with side and end elevations of the pipework. A schedule containing details on every pipe and fitting shall be included in the general arrangement drawing along with general notes on flange ratings and coatings. The schedule and plan provide a complete reference for future maintenance and augmentations.