

***COFFS HARBOUR CITY COUNCIL***



**DEVELOPMENT SPECIFICATION  
DESIGN**

***0071 Water supply - reticulation and pump  
stations (Design)***

***Version 1      01 January 2009***

**0071 RETICULATION AND PUMP STATIONS (DESIGN)**

**1 SCOPE AND GENERAL**

**Scope**

This worksection contains procedures for the design of a water reticulation system, including pump stations, either as a stand-alone project or part of a development.

Note: See Annexure A for incorporation of local requirements into this worksection.

**1.1 OBJECTIVE**

The objective of a water supply system is to provide to the consumer a reticulated (either potable or dual potable/raw) water supply to meet the demands imposed upon it by both the consumers and fire fighting requirements. Consumer requirements shall be met by providing a water main and allowing an appropriate point of connection for each individual property.

**1.2 COMPLIANCE**

The design of reticulation and pump station components shall comply with the Water Services Association of Australia's publication Water Supply Code of Australia unless specified otherwise herein and should be constructed in accordance with 1341 *Water – reticulation and pump stations (Construction)*.

**1.3 SUBSIDISED SCHEMES**

Where the Specification forms part of a contract attracting Government Grant funds, the Principal shall identify:

- Items which are not of the least cost option, that:
  - . Are intended to have a much longer design life than the normal asset service life detailed in the Asset Management Guidelines of the International Infrastructure Management Manual.
  - . Do not meet the project objectives and the requirements of the various Authorities for the least Net Present Value (NPV) but may become the preferred option for construction.
- Particular equipment which is procured without relevant competition through tendering
- Duplication of equipment or unit processes in a system configuration

**1.4 WORKSECTIONS TO BE USED BY THE DESIGNER**

In designing a water reticulation system it is assumed that the Designer shall possess, or have access to, the documents required to comply with this worksection.

The Designer shall include the requirements of 1341 *Water – reticulation and pump stations (Construction)*

The Designer shall use the latest edition of the Australian Standards, including amendments and supplements, unless specified otherwise.

References to the Water Supply Code of Australia (WSAA 03-2002 Version 2.3) are identified by part and section numbers and enclosed in brackets thus (WSAA Part, Section).

Water Supply Code of Australia drawings shall be used in preference to DPWS standard drawings (WSAA 03 Part 4).

**1.5 REFERENCED DOCUMENTS**

The following documents referred to in this worksection shall be deemed as the latest edition of the Australian Standards, including amendments and supplements:

**Worksection**

1341 *Water – reticulation and pump stations (Construction)*

**Standards**

- AS 1102 series Graphical symbols for electrotechnical documentation (various)
- AS 1111 series ISO metric hexagon bolts and screws
- AS 1112 series ISO metric hexagon nuts

AS 1214	Hot-dipped galvanised coatings on threaded fasteners (ISO metric coarse thread series)
AS 1281	Cement mortar lining of steel pipes and fittings
AS 1432	Copper tubes for plumbing, gasfitting and drainage applications
AS 1579	Arc-welded steel pipes and fittings for water and waste-water
AS 1646 series	Elastomeric seals for waterworks purposes
AS 1657	Fixed platforms, walkways, stairways and ladders—Design, construction and installation
AS 2129	Flanges for pipes, valves and fittings
AS 2200	Design charts for water supply and sewerage
AS 2634	Chemical plant equipment made from glass-fibre reinforced plastics (GRP) based on thermosetting resins
AS 2837	Wrought alloy steels—Stainless steel bars and semi-finished products
AS 3571	Glass filament reinforced thermosetting plastics (GRP) pipes—Polyester based—Water supply, sewerage and drainage applications
AS 3688	Water supply—Metallic fittings and end connectors
AS 3691	Solvent cement and priming (cleaning) fluids for use with ABS pipes and fittings
AS 3996	Access covers and grates
AS 4058	Precast concrete pipes (pressure and non-pressure)
AS 4087	Metallic flanges for Waterworks purposes.
AS 4441	Oriented PVC (PVC-O) pipes for pressure applications
AS/NZS 1477	PVC pipes and fittings for pressure applications
AS/NZS 1594	Hot rolled steel flat products
AS/NZS 2280	Ductile iron pipe and fittings
AS/NZS 2566	Buried flexible pipelines
AS/NZS 2566.1	Structural design
AS/NZS 2566.2	Installation
AS/NZS 3500	Plumbing and drainage
AS/NZS 3500.1	Water services
AS/NZS 3518	Acrylonitrile Butadiene Styrene (ABS) pipes and fittings for pressure applications
AS/NZS 3862	External fusion-bonded epoxy coating for steel pipes
AS/NZS 4129	Fittings for polyethylene (PE) pipes for pressure applications.
AS/NZS 4130	Polyethylene (PE) pipes for pressure applications.
AS/NZS 4131	Polyethylene (PE) compounds for pressure pipes and fittings.
AS/NZS 4158	Thermal-bonded polymeric coatings on valves and fittings for water industry purposes
AS/NZS 4321	Fusion-bonded medium-density polyethylene coating and lining for pipes and fittings
AS/NZS 4765	Modified PVC (PVC-M) pipes for pressure applications

**Other publications**

*NSW Department of Commerce*

MEW E101 Electrical Services Minimum Requirements

WS-SPEC Technical Requirements (TRs) and Strategic products Specifications (WSAA)

*Water Services Association of Australia (WSAA)*

WSAA 03 Water Supply Code of Australia

*Australian Building Codes Board*

BCA Vol 1—PART E1, Fire fighting equipment.

## 1.6 BIBLIOGRAPHY

### Standards

AS 1444	Wrought alloy steels—Standard, hardenability (H) series and hardened and tempered to designated mechanical properties
AS 2638 series	Gate Valves for waterworks purposes
AS 3578	Cast iron non-return valves for general purposes
AS 3579	Cast iron wedge gate valves for general purposes
AS 3680	Polyethylene sleeving for ductile iron pipelines
AS 3735	Concrete structures for retaining liquids
AS 3952	Water supply—Spring hydrant valve for waterworks purposes
AS 4020	Testing of products for use in contact with drinking water
AS 4041	Pressure piping
AS 4100	Steel structures
SAA HB 48	Steel structures design handbook
AS/NZS 1260	PVC-U pipes and fittings for drain, waste and vent application

### Other publications

*Institute of Public Works Engineering Australia (IPWEA)*

Guide to Codes and Practices for Streets Opening - Streets Opening Conference 2007 (Sections 5 and 6 detailing locations and depths of other services and preferred location for water reticulation pipes)

*NSW Department of Commerce*

PWD-WSIM Water Supply Investigation Manual

PWD Safety Guidelines for fixed ladders, stairways, platforms and walkways

## 2 DESIGN CRITERIA

### 2.1 GENERAL

#### Responsibility for design

Except where specified otherwise, the division of responsibilities between the Water Authority and the Designer shall be in accordance with WSAA 03 Part 1, Section 1.5.

#### Dual supplies

The Designer shall take into account the special requirements for dual water supplies where required by the Water Authority, including but not limited to, demand, size and location for each pipe system. Dual services shall not be installed unless part of a dual supply.

#### Valve type and location

The Designer shall take into account the location and type of valve required considering maintenance and repair requirements, the need for double air valves with integral isolating valve on mains or single air valve with isolating valve on reticulation mains, and scour points.

#### Cover over pipelines

##### Minimum cover

The minimum depth of cover to be provided for mains, measured vertically from the finished ground level to the top of any socket, shall be as follows (WSAA 03 Part 3, Sections 13, 17, 21, WAT-1201):

- 750 mm in embankments
- 600 mm in roadways and commercial areas
- 450 mm elsewhere

##### Special protection

Lesser cover may be provided where special protection of the pipelines has been shown on the Drawings or directed by the Superintendent. Special provisions are to be made to protect the pipe at all road crossings by use of Ductile Iron Pipe where Cover from construction traffic is less than 900mm.

### **Special needs**

Greater cover may be provided where special situations occur, where there is conflict with other services or to meet grading requirements.

### **Maximum cover**

The maximum cover shall be 1000 mm, unless otherwise directed.

## **2.2 RETICULATION PRESSURE**

### **Minimum static head**

Reticulation systems shall be designed to supply peak instantaneous demand by gravity while maintaining a minimum static head of 200 kPa (20 m). (WSAA 03 Part 1, Section 2.4.3).

### **Water demand**

A peak instantaneous demand of 0.15 L/s/tenement shall be used except that when supplying more than 1000 tenements, a demand of 0.10 L/s/tenement shall be used. Water demands for other industries shall be as detailed in the WSAA 03 Part 1, Section 2.2).

### **Maximum pressure**

The maximum pressure applied to a component of a pipeline shall in-service not exceed the safe working pressure of the component. The effect of water hammer shall be taken into account for the maximum pressure.

The maximum pressure applied to a component for field testing, including water hammer, shall not exceed the field test pressure recommended by the component manufacturer.

The maximum pressure during field testing or in-service along a pipeline shall take into account the permitted forces that can be applied to pipeline support structures such as trust blocks.

### **Desirable maximum pressure**

The desirable maximum pressure is 600 kPa. Zoning of the reticulation system by means of pressure reducing valves (PRV's) may be necessary to achieve these pressures across the development.

### **Fire fighting**

Water mains required for fire-fighting purposes in the development shall be designed in accordance with the Building Code of Australia.

### **Network analysis**

The Designer shall provide a network analysis of the reticulation system detailing the pressure and velocity distribution after consultation with the Water Authority.

## **2.3 PIPELINE**

### **Trunk mains**

Trunk mains directly supplying reticulation systems shall be designed as part of the reticulation system to carry peak instantaneous demands. (WSAA 03 Part 1, Sections 2.2 and 2.3)

### **Peak daily demand**

Mains feeding service reservoirs shall be designed to carry peak daily demands over 24 hours in the case of gravity mains and 22 hours in the case of rising mains.

### **Looped mains**

Reticulation mains shall be looped to eliminate dead ends unless permitted otherwise by the Water Authority.

### **Staged development**

Where a dead end is permitted to provide for future extension from staged development, the end shall be fitted with a stop valve, hydrant bend and hydrant.

### **Loss of supply**

Wherever possible, the development shall be serviced from two or more trunk mains to avoid the loss of supply in the event of maintenance or breakage.

### **Individual service**

Each dwelling shall have an individual service tapped from the main and extending 300 mm inside the lot boundary unless otherwise permitted by the Water Authority.

### **Valve chambers**

The Designer shall confirm with the Water Authority if valves are to be buried or housed in valve chambers.

The Designer shall show on the Drawings the type of cover and how the covers shall be seated. Where buried, the design shall be to WSAA 03 Part 1 Section 6, WAT-1301 to WAT 1306.

**Access covers**

Access covers shall be manufactured in accordance with AS 3996.

The Designer shall ensure that air valve covers have adequate openings for air exchange.

**Valve closing**

Stop valves shall be anti-clockwise closing.

**Valve maintenance**

The Designer shall provide for ease of valve maintenance within valve chambers, where provided, and select valve types such that servicing of the valve can be effected without removal from service, wherever possible.

**2.4 LOCATION**

In designing the reticulation system, standard locations shall be followed, as detailed below:

- Reticulation mains shall be laid in compliance with the Water Authority's standard footpath allocation for public utilities, or in the absence thereof, in conformity with the Streets Opening Conferences' protocols.
- Valves shall be located to avoid conflict with driveways, telephone house service pits and underground electrical boxes. Stop valves shall be located so that approximately 20 dwellings can be isolated for shutdowns.
- Hydrants shall be located on all reticulation mains at all high points and low points of the main and at dead ends. The interval between hydrants shall not exceed 60 metres.

Water mains located on private property shall be located in an easement of minimum width three (3) metres.

Unless there are compelling reasons to the contrary the water main shall be located in the centre of the easement. A Registered Surveyor shall survey easements and pipelines.

**2.5 MINE SUBSIDENCE AREAS AND AREAS OF SLIPPAGE**

**Ground strain**

The Designer shall accommodate the movement associated with the ground strain for the area, as advised by the Mine Subsidence Board for water reticulation jointing systems in proclaimed Mine Subsidence Areas, or in a known or expected area of subsidence or slippage.

The design ground strain for the development shall be detailed on the Drawings. (WSAA 03 Part 1, Section 5.5.4)

**Pipe jointing system**

The pipe jointing system selected shall be capable of accepting ground movements, without impairing the water tightness of the joint, for the ground strain as advised by the Mine Subsidence Board.

For non welded pipe systems in areas with high ground strains, a pipe jointing system using shorter effective length pipes and/or deep socket fittings shall be used.

The following action constitutes a WITNESS POINT (WP):

The Principal shall advise at the time of notification by the Designer whether the option to confer is required.

Where the Mines Subsidence Board does not cover an area of known, or suspected, subsidence or slippage, the above requirements shall still apply.

**3 MATERIALS**

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**3.1 GENERAL**

**Working pressure**

The working pressure of pipes, fittings, valves and hydrants shall be fit for the purpose in accordance with the relevant Australian Standard for the material and shall be at least 1200 kPa (120 m) unless otherwise specified by the water supply authority.

### **Class and standard**

The Designer shall select pipe type, class and standard based on pumping design and in accordance with AS 2200 and site conditions.

All pipes shall be a minimum Class 12 unless otherwise determined by the Supply Authority (WSAA 03 Part 1, Section 3.7).

### **Type**

Pipes and fittings for water reticulation shall be of unplasticised PVC (PVC-U), modified PVC (PVC-M), oriented PVC (PVC-O), ABS, ductile iron, steel, polyethylene, glass reinforced plastic (GRP), or copper. The material specifications for each pipe type are provided in the following Clauses 3.2 to 3.7 below.

### **Colour coding**

Where water pipes are to be located in close proximity to other service pipes and in dual systems, or where there is the likelihood of the pipes not being recognised as water pipes, the Designer shall provide for the pipes to be colour coded in accordance with WSAA 03 and shown on the Drawings accordingly.

### **External protection**

The Designer shall show on the Drawings the extent of external protection required. External protection shall be shown to comply with WSAA 03 Part 1 Section 4.12.

### **Piers**

Piers for any above ground water main shall be in accordance with WSAA 03 Drawing WAT-1310.

### **Special allowances**

The Designer shall allow for adequate working area, waste removal and transport arrangements where scouring points or pipe inspection locations are nominated (WSAA 03 Part 1, Sections 6.6 and 6.7).

### **Gauge locations**

The Designer shall indicate the location of connections for gauges required on mains.

### **Diameter**

The minimum diameter of all pipes shall be DN 100 unless otherwise specified by the Supply Authority. In areas zoned by the relevant planning authority for commercial, industrial or high-rise buildings the minimum diameter shall be DN 150, unless otherwise specified by the Supply Authority.

In all cases pipe sizes and residual pressures shall be designed to cater for fire fighting flows (WSAA 03 Part 1, Section 3.2 and particularly 3.2.2).

### **Limits of use**

The Designer shall take regard of the limits of use for the pipeline system materials under consideration (WSAA 03 Part 1, Sections 3.5, 3.6, 3.7 Table 3.1, Part 2 Section 8.6, Table 8.2).

### **Valves**

Where valves are specified and shown on the Drawings, they shall comply with the valve details in the Development construction specification—Water reticulation (WSAA 03 Part 1, Section 6).

### **Thrust blocks**

The Designer shall design thrust blocks to resist maximum allowable operating pressure (MAOP) of the pipe and the designated field test pressure.

### **Surge control**

The pipe material and class selection shall be appropriate for surge control.

## **3.2 PVC PIPES AND FITTINGS**

### **Pipe and fittings**

PVC (PVC-U) pipe shall comply with AS/NZS 1477 Series 2, blue in colour and with elastomeric seal spigot and socket joints.

Modified PVC (PVC-M) and oriented PVC (PVC-O) pipes and fittings shall comply with AS/NZS 4765 Series 2 and AS 4441 Series 2 respectively, and shall be blue in colour and with elastomeric seal spigot and socket joints. (WSAA 03 Part 2, Table 8.2).

### **Ductile iron compatible**

Where Series 1 PVC-U pipe complying with AS/NZS 1477 or Series 1 PVC-M pipe complying with AS/NZS 4765 is used in conjunction with ductile iron fittings ensure elastomeric seals appropriate to the application are used.

### **Pre-curved for cul-de-sac**

Where radii exceed allowable radii for bending on site, PVC pipes shall be pre-curved to suit the radius of any cul-de-sac road pavement in which they are to be installed.

### **Fittings**

Fittings for use with PVC pipe shall be elastomeric seal jointed. Valves shall comply with **Materials (General)**.

## **3.3 ABS PIPES AND FITTINGS**

Acrylonitrile butadiene styrene (ABS) pipes and fittings shall be manufactured in accordance with AS 3518 and joined in accordance with the manufacturer's instructions using solvent cement to AS 3691.

Selection of pipe class shall take into account cyclic loading.

## **3.4 DI PIPES AND FITTINGS**

### **Pipes and fittings**

Ductile iron (DI) pipes and fittings shall be manufactured in accordance with AS/NZS 2280 and shall be minimum Class PN 20 for elastomeric seal joints.

Where ductile iron pipes are to be flanged, AS/NZS 2280 Flange Class shall be specified. (WSAA 03 Part 2, Table 8.2)

### **Corrosion protection**

The Designer shall specify cement mortar lining in accordance with AS/NZS 2280, or fusion-bonded medium density polyethylene to AS/NZS 4158.

External protection shall be epoxy coating to AS/NZS 3862 where not otherwise specified as sleeved or wrapped, taking into account the type of corrosion protection required.

### **Joints**

Generally, pipe and fitting joints shall be specified to be spigot and socket type using a elastomeric seal push in seal made of natural rubber, ethylene propylene rubber or nitrile rubber with compounds complying with AS 1646.

### **Restrained joints**

The Designer shall take account of congested service corridors, poor soil conditions and the need for additional security for strategic mains with regard to the provision of restrained joints.

No restrained joint repair couplings were available at the time of publication of this worksection. A repair using couplings may require independent anchoring.

### **Flanges**

Flanges shall be specified to be manufactured in accordance with AS 4087 and AS 2129.

The Designer shall specify bolts and nuts for flanged joints in accordance with AS 2129, galvanised in accordance with AS 1214, or stainless steel in accordance with AS 2837 as for pumps specified in 1341 *Water – reticulation and pump stations (Construction)*.

## **3.5 STEEL PIPES AND FITTINGS**

### **Pipes and fittings**

Steel pipes and fittings shall be manufactured in accordance with AS 1579 and designed to AS/NZS 2566.1. (WSAA 03 Part 2, Table 8.2 ).

### **Joints**

The Designer shall specify the jointing system where long-term corrosion resistance, ease of construction or special circumstances dictate the need.

The pipe jointing shall be either:

- Elastomeric seal jointed with seals complying with AS 1646, or
- Butt welded, welded spigot and socket, or welded using a welding collar and with the application of a polyethylene heat shrunk sleeve over the weld, or wrapped, or
- Flanged to comply with AS 4087 to the table specified on the Drawings. Bolts and nuts for flanged joints shall be in accordance with AS 2129 and galvanised in accordance with AS 1214, or stainless steel in accordance with AS 2837 as for pumps specified in 1341 *Water – reticulation and pump stations (Construction)*.



### **Position under power lines**

Where the routes of continuously welded steel pipelines run in parallel with high voltage power lines sufficiently close to induce significant electrical currents in the pipeline, the Designer shall seek an alternate route or specify measures to prevent corrosion due o induced currents (WSAA 03 Part 1, Section 4.3.11 and Part 2, Table 8.2).

## **3.6 PE PIPES AND FITTINGS**

### **Pipes**

Polyethylene (PE) pipe shall be manufactured in accordance with AS/NZS 4130 and designed to AS/NZS 2566.1. (WSAA 03 Part 2, Table 8.2)

### **Fittings**

PE Fittings shall comply with AS/NZS 4129.

## **3.7 GRP PIPES, COLLARS AND FITTINGS**

### **Pipes and collars**

Glass reinforced thermosetting plastics (GRP) pipes and collars shall be manufactured to AS 3571 and designed to AS/NZS 2566.1. (WSAA 03 Part 2, Table 8.2).

The Designer shall take into account surge cycles and refer to the manufacturer when the temperatures are likely to exceed 35 °C.

### **Fittings**

GRP fittings shall comply with AS 2634. Ductile iron fittings complying with AS/NZS 2280 with appropriate elastomeric seals complying with AS 1646 may also be used.

## **3.8 COPPER PIPE AND FITTINGS**

### **Pipes**

Copper tube shall be manufactured in accordance with AS 1432 in the range of DN 6 to DN 200 for Type A or Type B. The Designer shall take into account the requirements of AS/NZS 3500.1.

### **Fittings**

Capillary and compression fittings shall be specified to comply with AS 3688 and de-zincification resistant. Capillary fittings shall have silver brazed joints or solder insert capillary joints.

## **4 PUMP STATIONS**

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### **4.1 GENERAL**

#### **Location**

The Designer shall take into account site access, site maintenance and restoration, easement, power supply and working area when locating pump stations in road reserves or on private property.

The following action constitutes a WITNESS POINT (WP):

The Principal shall advise at the time of notification by the Designer whether the option to confer on the locations is required.

#### **Pump building**

Pump units shall be secured under a purpose-designed building which shall be subject to the Development Approval (DA) of the Council.

The building shall match the aesthetics of the surrounding land use and shall accommodate any need for climate and/or acoustic control.

Occupational Health and Safety requirements shall be met especially with regard to clearance for maintenance, and avoidance of trip hazards.

#### **Substructure**

Where pumps are to be installed below ground level, the Designer shall provide for the pumps to be mounted on plinths and housed in a single pump well.

#### **Conditions**

The Designer shall provide for the construction of the pump well after taking into consideration the ground and site conditions.

### **Preformed components**

Preformed components or systems, complying with the Drawings, if any, may be used in lieu of in-situ construction provided:

- Preformed concrete wall units are to be manufactured to AS 4058. The Designer shall take into account the cover requirements for the reinforcing steel.
- Joints shall be internal flush
- The Designer shall ensure components make a watertight system and have a satisfactory surface finish.

### **Protection against flooding**

Where the pump station site is exposed to possible flooding, the Designer shall provide for the floor of the pump station or top of pump well, as appropriate, to be one (1) metre above the 1 in 100 year flood level or to such other level as provided by Council's planning instruments, whichever is the higher.

### **Protection against flotation**

The Designer shall provide for the design of pump wells against flotation both during the construction/installation stage and whilst operating under flood conditions designed as above.

### **Pump capacity**

Capacities of the pump unit shall be calculated from the intersection of the pump performance curve and the pipeline characteristic curve calculated at mid water level of the service reservoir involved with this duty point.

The pump station shall deliver the required transfer capacity over a period of 22 hours.

Standby pumping capacity shall be provided such that if one (1) pump is out of service, the pump station will remain able to supply the required transfer capacity.

The pump unit shall be capable of operating near optimal efficiency within the range of operating conditions.

### **Pump pipework**

All pipework and fittings shall be in accordance with this worksection. In addition, all steel bolts, nuts and washers shall comply with AS 1111 and AS 1112 and shall be galvanised in accordance with AS 1214 or stainless steel complying with AS 2837 Grade 316.

### **Pump prime**

Where there is negative suction head at the pump inlet, provision shall be made to facilitate priming of each pump.

### **Alarms and signals**

The Designer shall provide for alarms and signals systems with the concurrence of the Water Authority.

## **4.2 PUMPS**

### **Pump type**

Pumps shall comply with the WS-SPEC. The Designer shall take account of dismantling joints and valves provided in the pipework to facilitate removal of the pumps for maintenance and the need for surge control devices.

### **Inter-changeable**

Pump sets are to be interchangeable within each pump station where standby pumps are installed.

### **Structural steelwork**

The Designer shall design structural steelwork in accordance with HB 48.

## **4.3 ELECTRICAL**

### **Specification**

The works shall be designed in accordance with and subject to the provisions of MEW E101, except where modified by this worksection.

### **Design responsibility**

The Designer shall be responsible for the design of the equipment as suitable for the purpose. Equipment design shall comply with the requirements of the relevant standard specification.

### **SCA and electrical**

The Designer shall provide for Switchgear Control Assembly (SCA), SCA housing and electrical requirements as detailed in 1341 *Water – reticulation and pump stations (Construction)*.

### **Inter-changeability**

Where more than one (1) item of equipment is designed to form a particular function, all such items of equipment shall be identical and completely interchangeable (e.g. pilot lights, pushbuttons, relays, etc).

### **Switchboard**

The switchboard shall be installed visibly and physically accessible above all areas at risk of flooding.

### **Ambient conditions**

Ambient conditions shall be within the normally accepted limits of 0°C to 45°C.

The switchboard shall be connected to the local electricity supply system.

### **Connection to local supply**

Nominal system parameters:

415 volt, 3-phase, 4-wire, 50 Hz, solidly earthed neutral system.

Prospective Fault Current: As specified by the Local Supply Authority.

### **Automatic operation**

The pump station shall be designed for fully automatic operation in the unmanned condition.

## **4.4 POWER SUPPLY**

### **Consumer mains**

The consumer electrical mains shall be run underground where possible and commence at the point of attachment on a steel consumers pole (if applicable) installed near the property boundary and run in conduit to the switchboard.

The minimum size of the consumers mains shall be sized to satisfy the following requirements:

- Current carrying capacity to suit the maximum demand with an excess current carrying capacity of 30% minimum.
- Be sized for a voltage drop less than 1.5% of the maximum demand as calculated.
- Be single core PVC/PVC cables. XLPE insulated cable may also be used.
- Comply with the requirements of the Local Supply Authority.
- Pole termination method shall be determined in consultation with the Local Supply Authority.

## **4.5 TELEMETRY**

### **Schedule**

The Designer shall provide for telemetry requirements in accordance with the schedule supplied by the Water Authority.

### **Compatibility**

The telemetry system is to be compatible with the existing system, if any, in use.

## **4.6 LADDERS**

### **Specification**

Ladders shall comply with AS 1657 and applicable Occupational Health and Safety legislation.

### **Ladder landings**

If required, the Designer shall set intermediate landings in wells to achieve the minimum head room clearance. Wherever possible, the landing shall be located adjacent to fittings and machinery requiring maintenance.

### **Ladder cages**

Ladder cages shall not be used on ladders in pump station wells.

## **4.7 OTHER APPURTENANCES**

### **Lifting equipment**

The Designer shall provide for machinery lifting equipment including pump chains as necessary.

### **Gauges**

The Designer shall provide pressure tapping and gauges for all valves, including isolation and non-return valves as detailed in 1341 *Water – Reticulation and pump stations (Construction)*.

### **Covers**

The Designer shall take account of the possibility of site flooding ingress and overflow, and Occupational Health and Safety requirements in providing for access and inspection covers.

## **5 DOCUMENTATION**

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### **5.1 RETICULATION**

#### **Approval**

The Principal shall submit, to the relevant Water Authority for approval, four (4) copies of the proposed water main design, including calculations and network analysis, if appropriate, prior to commencement of construction. (WSAA 03 Part 1, Section 7).

The following action constitutes a WITNESS POINT (WP):

The Principal shall advise at the time of notification by the Designer whether the option to direct the submission to the Water Authority is taken.

#### **Drawings**

The Drawings shall show to scale:

- Plan showing:
  - . Lot boundaries and lot numbers.
  - . Location and size of all mains, appurtenances and pump stations.
  - . Existing mains.
  - . Existing and proposed features and services.
  - . North point and scale bar.
  - . Easement locations.
  - . Arrangement of other utilities.
- Longitudinal section showing:
  - . Reduced levels for natural surface and design surfaces at all changes in grade.
  - . Mains, appurtenances and pump stations.
  - . Appurtenances numbered in accordance with the relevant Water Authority's Asset Register.
  - . Invert levels where necessary.
  - . Size, type and class and grade of pipe. Also, pipe grade where appropriate.
  - . Location, invert level and size of all drainage lines, sewer mains, and other utility services crossing the main.
  - . Notation regarding all joining lines.
  - . Property ownership.
  - . Note 'In road' trench conditions.
- Pump stations—Drawings showing general arrangement of pump stations with site plan; concrete outlines; number, make, model and details of pumps; inlet and outlet pipework details and levels; pump cut in; cut out and alarm levels; switchboard location; pump station access details; design starts per hour.
- Corrosion protection—Drawings showing details of corrosion protection required for pipes and fittings.
- Trenchless installation—Drawings showing areas designated for trenchless pipe installation.

#### **Drawing scale, size and format**

Detail plans shall be drawn to a scale of 1:500 and longitudinal sections to a horizontal scale of 1:1000 and a vertical scale of 1:100.

Drawings shall be 'A3' and/or 'A1' size after consultation with the relevant Water Authority.

Drawings shall also be provided in electronic format after consultation with the relevant Water Authority.

#### **Location of fittings and fixtures**

The Designer shall show locations of hydrants, stop valves, non-return valves, air valves and scour valves, tees, tapers, creek crossings, trench dimensions and backfill, thrust blocks, and other existing

and proposed services and installations including chambers and covers and items of construction which are project specific.

## 5.2 PUMP STATION

### Approval

The Principal shall submit, to the relevant Water Authority for approval, prior to commencement of the manufacture of any pumps and control equipment, four (4) copies of the following:

- Switch and Control Gear Assemblies (SCA)—Proposed fully dimensioned manufacturing details, general arrangement (showing internal/external details) and foundation/gland plate details.
- Common Control—Complete circuit diagram and description of operation.
- Schedule of Equipment—Completed as to the equipment to be provided.
- Other Engineering drawings as required fully describing the proposed equipment.

The submission of the documents constitutes a WITNESS POINT (WP):

The Principal shall advise at the time of notification by the Designer whether the option to direct the submission to the relevant Water Authority is taken.

### Chlorination and access hazards

The Designer shall take into consideration the technical requirements to minimise all risks associated with chlorination, and entry into confined space.

### Drawing size and format

Drawings shall be on 'A3' and/or 'A1' size after consultation with the relevant Water Authority. All symbols used shall conform to AS 1102 and all wires and terminals shall be numbered.

Drawings shall also be provided in electronic form after consultation with the Water Authority.

### Asset register

The Designer shall provide asset schedules and Drawings in a form consistent with the existing or proposed Asset Register after consultation with the relevant Water Authority (WSAA 03 Part 1, Section 7.3).

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## 6 ANNEXURE A

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### 6.1 INSTRUCTION FOR SPECIFICATION PREPARATION

#### Incorporation of local requirements for water reticulation design

- This worksection recognises that each Council may need to vary the Specifications to meet local requirements. The items below may be taken into account in varying this design specification and 1341 *Water – reticulation and pump stations (Construction)* (Reticulation and pump stations).
- The Water Directorate, a close partner of the Institute of Public Works Engineering Australia (IPWEA) may provide additional information regarding the following:
  - . A complete list of Australian Standards relevant to Water Reticulation compiled as a result of a survey of Standards in use.
  - . A schedule of training organisations available to provide accreditation to Contractors and Superintendents.
  - . A schedule of organisations or Councils available to undertake disinfection of water mains together with guidelines for disinfection.
  - . A schedule of products in use compiled as a result of a survey of users.
  - . Advice on handling different requirements between the Council and any subsidising Authority. Differences identified include:
    - \* Provision of more expensive materials, fittings and pumps.
    - \* Water supply storage heads (20 m is called up compared to a minimum requirement of 12 m).
- The grading requirements called up for sand bedding may need to be checked where Council wishes to facilitate local acquisition 1341 *Water – reticulation and pump stations (Construction)* (**Pump bedding** and Table 4.2).
- Valve opening direction varies within and between Water Authorities. The requirements of the specifications may need to be checked against existing installations (**Pipeline** of this worksection).

- Working pressures vary, especially between the inland and the coast. The requirements of the specifications may need to be checked against existing conditions (**Reticulation pressure and Materials** of this worksection).
- Materials for PVC and PE fittings may be different for different size pipes. The requirements of the specifications may need to be checked against existing installations 1341 *Water – reticulation and pump stations (Construction)* (**PVC pipes and fittings** and **Polyethylene**).
- The requirement for the location of property services varies between Councils. The requirements of the specifications may need to be checked against existing installations (**Pipeline** of this worksection).
- Each Council may wish to consider any special requirements for the installation of long length water service connections. (Expand on **Pipeline** of this worksection).
- The method of marking access to fittings varies between Councils. The requirements of the worksections may need to be checked against existing requirements (1341 *Water – reticulation and pump stations (Construction)* **Marking Plates**).
- The number and timing for receipt of documents called up varies between Councils. The requirements of the specifications may need to be checked against existing requirements.
- Councils require varying lead times for notices to be given. The requirements of the specifications may need to be checked against existing requirements.
- Council may wish to consider the option for installation of curved pipes (e.g. in cul-de-sacs) (**PVC Pipes and Fittings** of this worksection).