NEW SOUTH WALES

DEVELOPMENT DESIGN SPECIFICATION

D11

WATER RETICULATION

AUS-SPEC appreciates the role of the NSW Water Directorate in comprehensively updating the design and construction specifications for water and sewer works.

INSTRUCTION FOR SPECIFICATION PREPARATION
(Delete this box before printing)

LOCAL REQUIREMENTS FOR WATER RETICULATION DESIGN

1. This Specification 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 the construction specification C401.

2. The Water Directorate, a division of the Institute of Public Works Engineering, may provide additional information regarding the following:

    a) A complete list of Australian Standards relevant to Water Reticulation compiled as a result of a survey of Standards in use.

    b) A schedule of training organisations available to provide accreditation to Contractors and Superintendents.

    c) A schedule of organisations or Councils available to undertake disinfection of water mains together with guidelines for disinfection.

    d) A schedule of products in use compiled as a result of a survey of users.

    e) Advice on handling different requirements between the Council and any subsidising Authority. Differences identified include:

        i. Provision of more expensive materials, fittings and pumps.

        ii. Water supply storage heads (20m is called up compared to a minimum requirement of 12m).

3. The grading requirements called up for sand bedding may need to be checked where Council wishes to facilitate local acquisition. (C401.26.2, Table C401.2).

4. Valve opening direction varies within and between Water Authorities. The requirements of the specifications may need to be checked against existing installations. (D11.06.9).

5. Working pressures vary, especially between the inland and the coast. The requirements of the specifications may need to be checked against existing conditions. (D11.05.1, D11.05.4, D11.09.1).

6. 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. (C401.04.1, C401.10.3).

7. The requirement for the location of property services varies between Councils. The requirements of the specifications may need to be checked against existing installations. (D11.06.6).

8. Each Council may wish to consider any special requirements for the installation of long length water service connections. (Expand on D11.06.6).

9. The method of marking access to fittings varies between Councils. The requirements of the specifications may need to be checked against existing requirements. (C401.41.3).

10. 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.

11. Councils require varying lead times for notices to be given. The requirements of the specifications may need to be checked against existing requirements.

12. Council may wish to consider the option for installation of curved pipes (eg in cul-de-sacs). (D11.10.3).

AUS-SPEC #1

Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
EXAMPLE 1	*Provision for acceptance of nonconformance with deduction in Payment*	*XYZ.00*	*AP*	*KP*	*2/6/97*

AUS-SPEC #1

DEVELOPMENT DESIGN SPECIFICATION D11
WATER RETICULATION

GENERAL

D11.01 SCOPE

1. The work to be executed under this Specification consists of the design of a water reticulation system either as a stand-alone project or part of a development. ***System***

2. This Specification contains procedures for the design of the following elements of a water supply system. ***Elements***

(a) Reticulation

(b) Pump Stations

3. The design of reticulation and pump station components shall comply with the Water Services Association of Australia's publication WATER RETICULATION CODE OF AUSTRALIA unless specified otherwise herein and should be constructed in accordance with the DEVELOPMENT CONSTRUCTION SPECIFICATION - WATER RETICULATION. ***Compliance***

4. Where the Specification forms part of a contract attracting Government Grant funds, the Principal shall identify: ***Subsidised Schemes***

(a) Items which are not of the least cost option, that

(i) 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.

(ii) 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.

(b) Particular equipment which is procured without relevant competition through tendering

(c) Duplication of equipment or unit processes in a system configuration

D11.02 OBJECTIVE

1. 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. ***Water Supply***

D11.03 REFERENCE AND SOURCE DOCUMENTS

1. Documents referenced in this Specification are listed below whilst being cited in the text in the abbreviated form or code indicated. The Designer shall possess, or have access to, the documents required to comply with this Specification. ***Documents***

2. References to the WATER RETICULATION CODE OF AUSTRALIA are made ***Water***

where there are parallel sections or equivalent clauses to those in this Specification. Where not called up as part of this Specification, these references are identified by part and section numbers and enclosed in brackets thus (WSA Part, Section).

Reticulation Code

(a) Council Specifications

C401 - Development Construction Specification Water Reticulation.

The Designer shall include the requirements of the DEVELOPMENT CONSTRUCTION SPECIFICATION - WATER RETICULATION .

(b) Australian Standards

References in this Specification or the Drawings to Australian Standards are noted by their prefix AS or AS/NZS. (WSA 03 Part 1, section 1.4, and Part 2)

Australian Standards

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

AS 1102	-	Graphical symbols for electrotechnical documentation (various)
AS/NZS 1111	-	ISO metric hexagon commercial bolts and screws
AS/NZS 1112	-	ISO metric hexagon nuts including thin nuts slotted nuts and castle nuts
AS 1214	-	Hot dipped galvanised coatings on threaded fasteners (ISO metric coarse thread series)
AS/NZS 1260	-	PVC pipes and fittings for drain, waste and vent applications
AS 1281	-	Cement mortar lining of steel pipes and fittings
AS 1432	-	Copper tubes for plumbing, gasfitting and drainage applications
AS 1444	-	Wrought alloy steels – Standard, hardenability (H) series and hardened and tempered to designated mechanical properties
AS 1449	-	Wrought alloy steels – Stainless and heat resisting steel plate, sheet and strip
AS 1460	-	Fittings for use with polyethylene pipes
AS/NZS 1477	-	PVC pipes and fittings for pressure applications
AS 1579	-	Arc welded steel pipes and fittings for water and wastewater
AS/NZS 1594	-	Hot rolled steel flat products
AS 1646	-	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/NZS 2280	-	Ductile iron pressure pipe and fittings
AS/NZS 2566.1	-	Buried flexible pipelines – Structural design
AS 2634	-	Chemical plant equipment made from glass fibre re-inforced plastics (GRP) based on thermosetting resins
AS 2638	-	Sluice Valves for waterworks purposes
AS 2837	-	Wrought alloy steels – Stainless steel bars and semi-finished products
AS 3500	-	National Plumbing and Drainage Code
AS 3518.1	-	Acrylonitrile Butadienne Styrene (ABS) pipes and fittings for pressure applications – Pipes
AS 3518.2	-	Acrylonitrile Butadienne Styrene (ABS) pipes and fittings for pressure applications – Solvent cement fittings
AS 3571	-	Glass filament reinforced thermosetting plastics (GRP) pipe - Polyester based - Water supply, sewerage and drainage applications
AS 3578	-	Cast iron non-return valves for general purposes
AS 3579	-	Cast iron wedge gate valves for general purposes

AS 3680	-	Polyethylene sleevings for ductile iron pipelines
AS 3688	-	Water supply – Copper and copper alloy body compression and capillary fittings and threaded-end connectors
AS 3691	-	Solvent cement and priming (cleaning) fluids for use with ABS pipes and fittings
AS 3735	-	Concrete structures for retaining liquid
AS 3855	-	Suitability of plumbing and water distribution systems products for contact with potable water
AS 3862	-	External fusion-bonded epoxy coating for steel pipes
AS 3952	-	Water supply- DN80 spring hydrant valve for general purposes.
AS 3996	-	Metal access covers, road grates and frames
AS 4020	-	Products for use in contact with drinking water
AS 4041	-	Pressure piping
AS 4058	-	Precast concrete pipes (pressure and non-pressure)
AS 4087	-	Metallic flanges for Waterworks purposes.
AS 4100	-	Steel structures
AS/NZS 4129(Int)		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(Int)		Modified PVC (PVC–M) pipes for pressure applications
HB 48	-	Steel structures design handbook

(c) Other

Institute of Public Works Engineering Australia (IPWEA)

- Streets Opening Conference Information Bulletin on Codes and Practices (Sections 3 and 4 detailing locations and depths of other services and preferred location for water reticulation pipes)

NSW Department of Public Works and Services (DPWS)

MEW E101	-	Electrical Services Minimum Requirements
PWD-WSIM	-	Water Supply Investigation Manual
PWD	-	Safety Guidelines for fixed ladders, stairways, platforms and walkways.
WS-SPEC	-	Technical Requirements (TRs) and Strategic products Specifications (WSAA)

Water Services Association of Australia (WSAA)

WSA 03	-	Water Reticulation Code of Australia

Building Codes Board of Australia

- Building Code of Australia - PART E1, Fire Fighting Equipment.

(d) Standard Drawings ***Drawings***

WATER RETICULATION CODE OF AUSTRALIA drawings shall be used in preference to DPWS standard drawings (WSA 03 Part 3).

AUS-SPEC #1

DESIGN CRITERIA

D11.04 GENERAL

1. Except where specified otherwise, the division of responsibilities between the Water Authority and the Designer shall be in accordance with the DEVELOPMENT CONSTRUCTION SPECIFICATION-WATER RETICULATION. (WSA 03 Part 1, section 2). ***Responsibility***

2. 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. ***Dual Supplies***

3. 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. ***Valve Type and Location***

D11.05 RETICULATION PRESSURE

1. Reticulation systems shall be designed to supply peak instantaneous demand by gravity while maintaining a minimum static head of 200 kPa (20m). (WSA 03 Part 1, section 2.4). ***Minimum Static Head***

2. 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 DEVELOPMENT CONSTRUCTION SPECIFICATION-WATER RETICULATION (WSA 03 Part 1, section 3) ***Water Demand***

3. Under no circumstances shall the pressure be able to equal or exceed the safe working pressure of the reticulation pipe material. The effect of water hammer is to be taken into account for the maximum pressure. ***Maximum Pressure***

4. 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. ***Desirable Maximum Pressure***

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

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

D11.06 PIPELINE

1. Trunk mains directly supplying reticulation systems shall be designed as part of the reticulation system to carry peak instantaneous demands. (WSA 03 Part 1, sections 3 and 4) ***Trunk Mains***

2. 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. ***Peak Daily Demand***

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

4. 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. ***Staged Development***

5. Wherever possible, the development shall be serviced from two or more trunk ***Loss of Supply***

mains to avoid the loss of supply in the event of maintenance or breakage.

6. Each dwelling shall have an individual service tapped from the main and extending 300mm inside the lot boundary. ***Individual Service***

7. 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 the DEVELOPMENT CONSTRUCTION SPECIFICATION - WATER RETICULATION (WSA Part 3, WAT-206). ***Valve Chambers***

8. Metal access covers shall be manufactured in accordance with AS 3996. The Designer shall ensure that air valve covers have adequate openings for air exchange. ***Access Covers***

9. Stop valves shall be clockwise closing. ***Valve Closing***

10. 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. ***Valve Maintenance***

D11.07 LOCATION

1. In designing the reticulation system, standard locations shall be followed, as detailed below: ***Standard Location***

   (a) 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.

   (b) 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.

   (c) Hydrants shall be located on all reticulation mains. The interval between hydrants shall not exceed 60 metres, at all high and low points of the main, and at dead ends.

2. 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.

D11.08 MINE SUBSIDENCE AREAS AND AREAS OF SLIPPAGE

1. 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. (WSA 03 Part 1, section 4.3.3.3) ***Ground Strain***

2. 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 areas with high ground strains a pipe jointing system using shorter effective length pipes and/or deep socket fittings shall be used. This action constitutes a **WITNESS POINT**. The Principal shall advise at the time of notification by the Designer whether the option to confer is required. ***Pipe Jointing System***

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

MATERIALS

D11.09 GENERAL (WSA 03 Part 2)

1. 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 (120m). ***Working Pressure***

2. 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. (WSA 03 Part 1, sections 2.3.2, 2.3.3.1, 2.3.3.2, 3.7.2.1, and 3.7.2.2). ***Class and Standard***

3. Pipes and fittings for water reticulation shall be of unplasticised PVC, modified PVC, ABS, ductile iron, steel, polyethylene, glass reinforced plastic (GRP), or copper. The material specifications for each pipe type are provided in clauses D11.10 to D11.16 inclusive. ***Type***

4. 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 and shown on the Drawings accordingly. ***Colour Coding***

5. The Designer shall show on the Drawings the extent of external protection required to be undertaken by the Contractor. External protection shall be shown to comply with the DEVELOPMENT CONSTRUCTION SPECIFICATION-WATER RETICULATION. (WSA 03 Part 1 section 4.11) ***External Protection***

6. Piers for any above ground water main shall be in accordance with the DEVELOPMENT CONSTRUCTION SPECIFICATION - WATER RETICULATION (WSA 03 Drawing WAT-108). ***Piers***

7. The Designer shall allow for adequate working area, waste removal and transport arrangements where scouring points or pipe inspection locations are nominated. (WSA 03 Part 1, section 4.8) ***Special Allowances***

8. The Designer shall indicate the location of connections for gauges required on mains. ***Gauge Locations***

9. The minimum diameter of all pipes shall be 100 mm unless otherwise determined by the Supply Authority. In commercial, industrial or high-rise building areas the minimum shall be DN150. In all cases pipe sizes and residual pressures shall be designed to cater for fire fighting flows. (WSA 03 Part 1, sections 2.3.1.1 and 3.7.3.1) ***Diameter***

10. The Designer shall take regard of the limits of use for the pipeline system materials under consideration. (WSA 03 Part 2, sections 2.5, 3.6, 4.6, 5.6, 6.6, and 7.6) ***Limits of Use***

11. Where valves are specified and shown on the Drawings, they shall comply with the valve details in the DEVELOPMENT CONSTRUCTION SPECIFICATION - WATER RETICULATION. (WSA 03 Part 1, section 4.7.1) ***Valves***

12. The Designer shall design thrust blocks to resist maximum pressure of the pipe, not the estimated surge pressure. ***Thrust Blocks***

13. The Designer shall provide for surge control by specifying an appropriate pipe material and class selection. ***Surge Control Method***

AUS-SPEC #1

D11.10 UNPLASTICISED AND MODIFIED PVC (uPVC and PVC-M) PIPE

1. Unplasticized PVC (uPVC) pipe shall be specified to be manufactured in accordance with AS/NZS 4020, AS/NZS 1477 Series 2, blue in colour and with rubber ring (elastomeric) spigot and socket joints. Modified PVC (PVC-M) pipes and fittings shall be specified to be manufactured in accordance with AS/NZS 4020, AS/NZS 4765, blue in colour and with rubber ring (elastomeric) spigot and socket joints. (WSA 03 Part 2, section 7). ***Standard***

2. The Designer shall ensure that PVC pipe is compatible with ductile iron (DI) pipe where necessary. ***DI Compatible***

3. PVC pipes shall be pre-curved to suit the radius of any cul-de-sac road pavement in which they are to be installed. ***Pre-curved***

4. Fittings for use with PVC pipe shall be elastomeric seal jointed. ***Fittings***

D11.11 ACRYLONITRILE BUTADIENE STYRENE (ABS) PIPE AND FITTINGS

1. ABS pipes and fittings shall be specified to be manufactured in accordance with AS 3518.1 and AS 3518.2 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. ***Standard***

D11.12 DUCTILE IRON (DI) PIPE AND FITTINGS

1. Ductile iron pipes and fittings shall be specified to be manufactured in accordance with AS/NZS 2280 minimum Class K9 for rubber ring (elastomeric) joints. Where pipes are to be flanged, Class K12 shall be specified. (WSA 03 Part 2, section 3) ***Standard***

2. The Designer shall specify cement mortar lining in accordance with AS 1281, or fusion-bonded medium density polyethylene to AS/NZS 4321. External protection shall be epoxy coating to AS 3862 where not otherwise specified as sleeved or wrapped, taking into account the type of corrosion protection required. ***Corrosion Protection***

3. Generally, pipe and fitting joints shall be specified to be spigot and socket type using a rubber ring (elastomeric) push in seal made of natural rubber, ethylene propylene rubber or nitrile rubber with compounds complying with AS 1646. The seal shall be a single jointing component shaped to provide both groove lock and seal mechanisms. ***Joints***

4. 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. ***Restrained Joints***

5. Flanges shall be specified to be manufactured in accordance with AS 4087 and AS 2129 Table C. 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 1449 as for pumps specified in the DEVELOPMENT CONSTRUCTION SPECIFICATION - WATER RETICULATION. ***Flanges***

D11.13 STEEL PIPE AND FITTINGS

1. Steel pipes and fittings shall be specified to be manufactured in accordance with AS 1579 and AS/NZS 1594 and designed to AS/NZS 2566.1. (WSA 03 Part 2, section 4). ***Standard***

2. 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:

(a) Rubber ring (elastomeric) jointed to conform to AS 1646, or

(b) Welded with butt welding or by using a welding collar with the application of a polyethylene heat shrunk sleeve over the weld, or wrapped, or

(c) 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 the DEVELOPMENT CONSTRUCTION SPECIFICATION WATER RETICULATION.

3. The Designer shall avoid the positioning of continuously welded steel pipelines in parallel with high voltage power lines. (WSA 03 Part 1, section 4.11.3) ***Power Lines***

D11.14 POLYETHYLENE PIPE AND FITTINGS

1. Polyethylene pipe shall be specified to be manufactured in accordance with AS/NZS 4130 and designed to AS/NZS 2566.1. (WSA 03 Part 2, section 6) ***Standard***

2. Fittings shall comply with AS/NZS 4129 with compounds to AS/NZS 4131. ***Fittings***

D11.15 GLASS REINFORCED PLASTIC (GRP) AND FITTINGS

1. Glass filament reinforced thermosetting plastics (GRP) pipes shall be specified to be manufactured to AS 3571 and designed to AS/NZS 2566.1. (WSA 03 Part 2, section 5). The Designer shall take into account surge cycles and refer to the manufacturer when the temperatures are likely to exceed 35^{o}C. ***Standard***

2. Fittings shall comply with AS 2634.

D11.16 COPPER PIPE AND FITTINGS

1. Copper tube shall be specified to be manufactured in accordance with AS 1432 in the range of DN6 to DN200 for Type A or Type B. The Designer shall take into account the requirements of AS 3500. (WSA 03 Part 2, section 2) ***Standard***

2. 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. ***Fittings***

PUMP STATIONS

D11.17 GENERAL

1. 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. This action constitutes a **WITNESS POINT**. The Principal shall advise at the time of notification by the Designer whether the option to confer on the locations is required. ***Location*** ***WP***

2. 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. ***Pump Building***

3. 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. ***Substructure***

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

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

(a) Preformed concrete wall units are to be manufactured to AS 4058. The Designer shall take into account the cover requirements for the reinforcing steel.

(b) Joints shall be internal flush

(c) The Designer shall ensure components make a watertight system and have a satisfactory surface finish.

6. 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 Flooding***

7. 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. ***Protection Against Flotation***

8. 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 Capacity***

9. All pipework and fittings shall be in accordance with this Specification. In addition, all steel bolts, nuts and washers shall comply with AS/NZS 1111 and AS/NZS 1112 and shall be galvanised in accordance with AS 1214 or stainless steel complying with AS 1449 grade 316. ***Pump Pipework***

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

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

D11.18 PUMP

1. 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. ***Pump Type***

2. Pump sets are to be interchangeable within each pump station where standby pumps are installed. ***Inter-Changeable***

3. The Designer shall design structural steelwork in accordance with HB 48. ***Structural Steelwork***

D11.19 ELECTRICAL

1. Notwithstanding other clauses mentioned herein, the Designer shall be responsible for the design of the equipment as suitable for the purpose. Equipment ***Design Responsibility***

design shall comply with the requirements of the relevant standard specification.

2. The Designer shall provide for Switchgear Control Assembly (SCA), SCA housing and electrical requirements as detailed in the DEVELOPMENT CONSTRUCTION SPECIFICATION-WATER RETICULATION. ***SCA and Electrical***

3. 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 (eg pilot lights, pushbuttons, relays, etc). ***Inter-changeability***

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

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

6. The switchboard shall be connected to the local electricity supply system. ***Connection to Local Supply***

Nominal system parameters:

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

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

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

8. The pump station shall be designed for fully automatic operation in the unmanned condition. ***Automatic Operation***

D11.20 ELECTRICAL POWER SUPPLY

1. 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. ***Consumer Mains***

2. The minimum size of the consumers mains shall be sized to satisfy the following requirements: ***Minimum Size***

(a) Current carrying capacity to suit the maximum demand with an excess current carrying capacity of 30 per cent minimum.

(b) Be sized for a voltage drop less than 1.5 per cent of the maximum demand as calculated.

(c) Be single core PVC/PVC cables. XLPE insulated cable may also be used.

(d) Comply with the requirements of the Local Supply Authority.

(e) Pole termination method shall be determined in consultation with the Local Supply Authority.

D11.21 TELEMETRY

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

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

AUS-SPEC

D11.22 LADDERS

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

2. 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 Landings***

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

D11.23 OTHER APPURTENANCES

1. The Designer shall provide for machinery lifting equipment including pump chains as necessary. ***Lifting Equipment***

2. The Designer shall provide pressure tapping and gauges for all valves, including isolation and non-return valves as detailed in the DEVELOPMENT CONSTRUCTION SPECIFICATION-WATER RETICULATION. ***Gauges***

3. 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. ***Covers***

DOCUMENTATION

D11.24 RETICULATION

1. The Principal shall submit, to the 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. (WSA 03 Part 1, section 5) This action constitutes a **WITNESS POINT**. 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. ***Review*** ***WP***

2. The Drawings shall show to scale:

   (a) Plan showing: ***Plan***

      (1) Lot boundaries and lot numbers

      (2) Location and size of all mains, appurtenances and pump stations

      (3) Existing mains

      (4) Existing and proposed features and services

      (5) North point and scale bar

      (6) Easement locations

      (7) Arrangement of other utilities.

   (b) Longitudinal section showing: ***Longitudinal Section***

      (1) Reduced levels for natural surface and design surfaces at all changes in grade

(2) Mains, appurtenances and pump stations

(3) Appurtenances numbered in accordance with Water Authority's Asset Register

(4) Invert levels where necessary

(5) Size, type, class and grade of pipe

(6) Location, invert level and size of all drainage lines, sewer mains, and other utility services crossing the main

(7) Notation regarding all joining lines

(8) Property ownership

(9) Note "In road" trench conditions

(c) 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. ***Pump Stations***

(d) Details of corrosion protection required for pipes and fittings. ***Pipe Protection***

(e) Areas designated for trenchless pipe installation. ***Trenchless Installation***

3. 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. 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. ***Drawing Scale***

4. Drawings shall be 'A3' and/or 'A1' size after consultation with the Water Authority. ***Drawing Size***

5. Drawings shall also be provided in electronic form after consultation with the Water Authority. ***Electronic Form***

D11.25 PUMP STATION

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

(a) Switch and Control Gear Assemblies (SCA) - Proposed fully dimensioned manufacturing details, general arrangement (showing internal/external details) and foundation/gland plate details.

(b) Common Control - Complete circuit diagram and description of operation.

(c) Schedule of Equipment - Completed as to the equipment to be provided.

(d) Other Engineering drawings as required fully describing the proposed equipment.

The submission of the documents constitutes a **WITNESS POINT**. The Principal shall ***WP***

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

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

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

4. Drawings shall also be provided in electronic form after consultation with the Water Authority. ***Electronic Form***

D11.26 ASSET REGISTER

1. The Designer shall provide asset schedules and Drawings in a form consistent with the existing or proposed Asset Register after consultation with the Water Authority. (WSA 03 Part 1, section 5.6) ***Consistency***

SPECIAL REQUIREMENTS

D11.27 RESERVED

D11.28 RESERVED

D11.29 RESERVED

AUS-SPEC #1

SPECIFICATION D11 - WATER RETICULATION

CONTENTS

AUS-SPEC #1

AUS-SPEC #1